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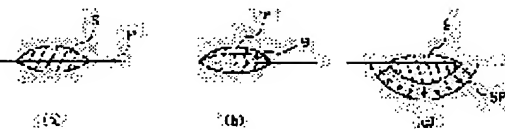
Priority country : JP

(54) INK JET PRINTING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a method for forming a high quality image excellent in fixture by an ink jet recording method employing a pigment ink.

SOLUTION: A mixed ink including both a first self-dispersion type pigment and a second pigment, which is dispersedly compounded with at least either one of a polymer dispersant having the same polarity as that of the polar group of the first pigment and a nonionic polymer dispersant, in a water-based medium, or one set of two kinds of inks, which respectively include the first pigment and the second pigment and a processing liquid, which reacts with the inks are prepared. To the region, to which the processing liquid is given, on a printing medium, the processing liquid and the mixed ink or the set of the inks are given under the state being brought into contact with one another under liquid states by an ink jetting method.



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CLAIMS

[Claim(s)]

[Claim 1] The ink-jet print method including the process which records a picture on a print medium characterized by providing the following (i) This process (i) is performed by having process; which makes the processing liquid which has reactivity with process; which makes ink adhere on a print medium using the ink-jet record method, and (ii) this ink adhere on this print medium so that this ink and this processing liquid may touch in the state of a liquid on this print medium after this process (ii), and this ink is the 1st pigment in an aqueous medium. The 2nd pigment The macromolecule dispersant for distributing this 2nd pigment Both *****, this 1st pigment, and this 2nd pigment are contained in this ink in the state of distribution. At least one anionic basis minds [this 1st pigment] direct or other atomic groups. It is the pigment of self-distributed type with which the pigment of self-distributed type combined with the front face of this 1st pigment through direct or other atomic groups. Either [at least] the macromolecule dispersant of a basis and like-pole nature with which this 2nd pigment is a pigment which this aqueous medium can be made to distribute with a macromolecule dispersant, and this macromolecule dispersant is combined with the front face of this 1st pigment, or the macromolecule dispersant of Nonion nature.

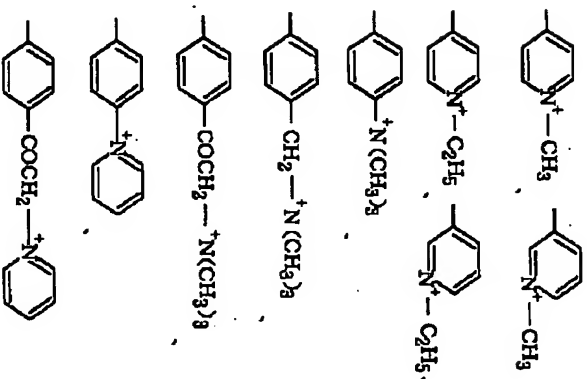
[Claim 2] The aforementioned processing liquid is the ink-jet print method according to claim 1 that the osmosis speed is more than 5.0 (ml-m-2 and msec-1/2) in Ka value by the Bristow method.

[Claim 3] This ink is the ink-jet print method according to claim 1 or 2 that the osmosis speed is less than -1/2 1 ml-m-2 and msec in Ka value by the Bristow method.

[Claim 4] The ink-jet print method given in any of claims 1-3 they are that the aforementioned anionic machine is at least one chosen from the anionic machines shown below. - COOM, - SO3M, -PO3HM, and -PO3M2 (such M expresses independently a hydrogen atom, alkali metal, ammonium, or organic ammonium, respectively.)

[Claim 5] The ink-jet print method given in any of claims 1-4 they are that the aforementioned cation nature machine is at least one chosen from the cation nature machines shown below.

- NH3+, -NR3+, -SO2NH2, -SO2NHCOR, [Formula 1]



(R shows independently the naphthyl group which is not replaced [the phenyl group which is not replaced / the shape of a straight chain, a branched-chain alkyl group, substitution, or /, substitution, or] among the above-mentioned formula, respectively.)

[Claim 6] The aforementioned atomic group is the ink-jet print method according to claim 1 which is the naphthylene machine which may have the phenylene group which may have the alkylene machine of carbon numbers 1-12, and a substituent, or a substituent.

[Claim 7] The ink-jet print method according to claim 1 that 80% or more of the particle of the 1st pigment of the above is the particle size of 0.05-0.3 micrometers.

[Claim 8] The ink-jet print method according to claim 1 that 80% or more of the particle of the 1st pigment of the above is the particle size of 0.1-0.25 micrometers.

[Claim 9] The ink-jet print method according to claim 1 currently distributed when the 2nd pigment of the above adsorbs a macromolecule dispersant on the front face.

[Claim 10] The ink-jet print method according to claim 1 that the aforementioned macromolecule dispersant is either [at least] a sulfonic-acid system macromolecule dispersant or a carboxylic-acid system macromolecule dispersant.

[Claim 11] The ink-jet print method according to claim 1 that the 2nd pigment of the above contains two kinds of pigments with which structures differ at least.

[Claim 12] The ink-jet print method according to claim 1 that the ranges of the weight ratio of this 1st pigment and the 2nd pigment are 5 / 95 - 97/3.

[Claim 13] The ink-jet print method according to claim 1 that the ranges of the weight ratio of this 1st pigment and the 2nd pigment are 10 / 90 - 95/5.

[Claim 14] The ink-jet print method according to claim 1 that the ranges of the ratio of this 1st pigment and the 2nd pigment are 9 / 1 - 4/6.

[Claim 15] The ink-jet print method containing more this 1st pigment than this 2nd pigment according to claim 1.

[Claim 16] Either [at least] this 1st pigment or the 2nd pigment is the ink-jet print method according to claim 1 which is carbon black.

[Claim 17] The ink-jet print method containing the polar color as the basis further combined with the front face of this 1st pigment with this same ink according to claim 1.

[Claim 18] The ink-jet print method according to claim 17 that this color is an anionic color or a

cation nature color.

[Claim 19] The ink-jet print method according to claim 18 that this anionic color is at least one chosen from acid dye, a substantivity color, and a reactive dye.

[Claim 20] The ink-jet print method according to claim 18 that this anionic color has a JISUAZO frame or a tris azo frame.

[Claim 21] The ink-jet print method given in any of claims 1-20 they are that this processing liquid contains the compound which has at least one polar basis opposite to the basis combined with the front face of this 1st pigment.

[Claim 22] The ink-jet print method given in any of claims 1-21 they are that this processing liquid contains the 1st compound which has one polar basis opposite to the basis combined with the front face of this 1st pigment, and the 2nd compound which has two or more polar bases opposite to the basis combined with the front face of this 1st pigment.

[Claim 23] The ink-jet print method according to claim 22 that this 1st compound is a benzalkonium chloride and this 2nd compound is the poly allylamine.

[Claim 24] The ink-jet print method of this 1st compound in this processing liquid, and this 2nd compound according to claim 22 or 23 currently comparatively optimized substantially to composition of this ink.

[Claim 25] The ink-jet print method to the print medium characterized by providing the following (i) — process, which gives the process; (ii) 2nd ink which gives the 1st ink to this print medium to this print medium — and (iii) — this — the process which gives each of the 1st and 2nd ink, and the processing liquid which reacts to this print medium — It ***, each of this 1st ink, this 2nd ink, and this processing liquid it is what is given so that each may contact in the state of a liquid in the front face of a print medium. This 1st ink At least one anionic machine minds [of a pigment particle] direct or other atonic groups. The self-distributed pigment with which the self-distributed pigment or at least one cation nature machine combined is combined through direct or other atonic groups is included in a water medium as the 1st pigment, and this 2nd ink is the 2nd pigment. The macromolecule dispersant for distributing this 2nd pigment It is what contains in a ***** medium and this 2nd pigment may distribute in this water medium with this macromolecule dispersant. A polar compound opposite to the basis by which this processing liquid is combined with the front face of this 1st pigment including either [at least] the macromolecule dispersant of a basis and like-pole nature with which this macromolecule dispersant is combined with the front face of this 1st pigment, or the macromolecule dispersant of Nonion nature

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the ink-jet print method which prints a character, a picture, etc. on print media, such as a print form and an OHP form, using the liquid (processing liquid is called hereafter) made to insolubilize the ink containing color material, and the coloring material in this ink in detail about the ink-jet print method.

[0002]

[Description of the Prior Art] low noise, a low running cost, the possibility of a high-speed print, ease [the miniaturization of equipment], and colorization are easy for an ink-jet print method - etc. - it is the method which has various advantages and is widely used in the printer, the copying machine, etc. Generally by such printer, the ink used from viewpoints, such as print grace, such as print properties, such as a regurgitation property and fixing nature, bleeding of a print picture, and optical reflection density, coloring nature, is chosen. By the way, it is just going to be known widely that ink will be divided roughly into two kinds, color ink and pigment ink, by the color material to contain.

[0003] Among these pigment ink is excellent in water resistance and lightfastness compared with color ink, and has an advantage, such as making clear character grace possible. On the other hand, as compared with color ink, fixing to a print medium takes time, or, as for pigment ink, the inclination for the size of the ink dot by which the scratch-proof nature of the picture after fixing is also formed on a print medium of the ink which may not be enough and is breathed out by 1 discharging from a nozzle to become small is seen. That is, the pigment contained in pigment ink is made to overcome the intermolecular force which usually mainly acts between the pigment particles which bring about condensation of a pigment particle using the electric repulsive force of a macromolecule dispersant etc., and is stably distributed in ink. Therefore, it is desirable to add a macromolecule dispersant according to the amount of a pigment in ink. Usually, in the paper, if the ink-jet recording method is used and printed in the paper, pigments will condense such ink by osmosis on the paper of the solvent of ink, such as moisture, and evaporation into air. Under the present circumstances, the cohesive force of ink becomes strong, so that there are many amounts of the macromolecule dispersant contained in ink as behavior of the ink in the paper. Therefore, the path of the ink dot formed on a print medium in the ink which has the fixed volume breathed out from the ink-jet head serves as a dot configuration still near the configuration where it was distorted at the time of becoming small and colliding with paper. Therefore, in order to obtain the ink dot of the diameter of a dot required for record which has sufficient record concentration to form a picture, and does not have generating of white *** etc., it is necessary to adjust the regurgitation volume of the ink from an ink-jet head to oversized. However, even if it performed such adjustment, delay of fixing to the print medium of ink is conjointly caused with the fall of the permeability to Kaminaka by the cohesive force of the pigment particle to which the macromolecule dispersant stuck being strong, or the scratch-proof nature of a record picture might be reduced.

[0004] In order to aim at expansion of the diameter of a dot, and improvement in fixing nature, also making ink contain a penetrating agent for the purpose of improvement in the permeability

to the print medium of ink is considered. However, this may concur with the phenomenon which is not desirable, when aiming at high-definition record pictures, such as degradation (degradation of circumference [dot] configurations, such as the so-called feathering) of a dot configuration, and osmosis (the so-called strike-through) of the ink to the rear face of paper. Moreover, since-color material permeates the interior of a print medium, even if the diameter of a dot becomes comparatively large, OD of an ink dot does not become not much high in many cases. Moreover, in the application to the business use of an ink jet printer for which positive expansion is called for, achieved from now on, it is expected that much more improvement in printing speed is called for. In process in which a record medium [finishing / be / inadequate / the fixing nature to the record medium of ink / printing /, for example] is discharged continuously, and the laminating is then carried out one by one from the ink jet printer. The laminating of the 2nd record medium discharged before fixing of the ink of the front face of the 1st record medium discharged previously following on this 1st record medium is carried out to the printing side of this 1st record medium. Possibility that the problem that the picture of the 1st record intermediation body surface is confused, or the ink of the 1st record medium adheres to the rear face of the 2nd record medium will arise can be considered.

[0005] Furthermore, the ink using the pigment of self-distributed type is proposed, and although expansion of the diameter of a dot can be aimed at compared with the ink containing the pigment distributed by said dispersant in this ink probably because the cohesive force of the pigment in the paper is weak, it cannot be said that it is still enough.

[0006] Thus, it can be told to the print method which fills with high level the high optical density of various elements which influence the grace of a record picture, for example, the fixing nature of ink, expansion of the diameter of an ink dot, the homogeneity of the concentration within an ink dot, and the ink dot itself etc. that the room of research and development is much left behind.

[0007] The method of on the other hand giving ink and this ink, and the processing liquid that react on this print medium in ink-jet print technology for the purpose of much more improvement in printing grace or picture grace (for example, the water resistance of the picture on a print medium, improvement in optical density (OD), etc.) so that this ink and this processing liquid react on a print medium is proposed until now, and is put in practical use.

[0008]

[Problems to be Solved by the Invention] This invention persons performed examination energetic about the ink-jet record technology which used together the processing liquid which has the reactivity of pigment ink and this pigment ink that destroys the pigment dispersibility of this pigment ink at the time of record that a technical problem peculiar to pigment ink should be solved, harnessing the property which was excellent in pigment ink. As part of the examination, after giving processing liquid to a print medium front face, the record process which gives pigment ink so that it may be mixed with this processing liquid on this print medium in the state of a liquid was carried out. The picture acquired as the result was observed even when grace fell rather rather than the picture which may be unable to satisfy about the quality and was formed by the pigment ink independent. In the combination of the pigment ink which specifically contains the pigment distributed in the water medium with the macromolecule dispersant as pigment ink, this pigment ink, and the processing liquid which reacts, there was a case where the fall of the optical density (OD) to which the area factor of an ink dot originates in a small thing was accepted. Although the reason which such a phenomenon produces is not clear, it is thought that it will be because the condensation on the print medium of the pigment in ink was sharply promoted with processing liquid. Therefore, although an area factor can be enlarged by increasing the amount of placing of pigment ink and improvement in OD can be aimed at, it may be admitted that fixing nature is inferior in this case. Moreover, in a part for the side edge of the dot on the print medium obtained with the combination of the pigment ink which contains the pigment of self-distributed type as pigment ink, this pigment ink, and processing liquid which reacts, the phenomenon called "the so-called exudation" or so-called "mist" arose, and a clear dot might not be obtained. Drawing 1 is the mimetic diagram of the dot which this "exudation" and "mist" produced, and "mist" section 7 by "exudation" is observed around the reaction

section of central pigment ink 8 and processing liquid 6. Drawing 2 is drawing which explains the generating mechanism of this phenomenon in presumption.

[0009] If it is given in piles as the pigment ink (it abbreviates to "dispersant-less pigment ink" henceforth) Ia which does not contain a macromolecule dispersant in the position where this processing liquid S was given including a self-distributed pigment showed drawing 2 (b) after processing liquid S is given to the print media P (especially regular paper etc.), generation of a reactant 9 will start. And while this reaction advances, as shown in this drawing (c), "exudation" of a radial is mostly produced from the dot of a circle configuration, and it will be in the state by the reactant where "mist" started the circumference, by the whole dot. Since such "exudation" or "mist" is similarly recognized to be well-known feathering, an appearance top degrades print trace.

[0010] It is guessed that the “exudation” or the “mist” which were mentioned above are the phenomena chemical or following in micro. Although dispersant-less pigment ink has a comparatively large reaction rate in a reaction with the processing liquid, the pigment which was being distributed for this reason produces distributed destruction in an instant, and the cluster of a reactant is generated, the reactant of the shape of a detailed particle is also produced with this. And since the reactant of the shape of this particle flows out with expansion at the nose of cam SP of osmosis to the print medium of the processing liquid shown in drawing 2 (c), it is thought that “above-mentioned exudation” and above-mentioned “mist” appear as the result.

[0011] Thus, it was difficult for the event which this invention persons cannot predict to arise and to acquire a high-definition ink-jet record picture only by combining pigment ink and processing liquid simply. And for achievement of the desired end of improving the fault of pigment ink, this invention persons have recognized that the further ED is required, harnessing the advantage of pigment ink using the ink-jet record technology, using processing liquid.

[0012] Moreover, when the expansion to the business field of an ink jet printer is taken into consideration, it is thought that much more improvement in printing speed comes to be required. One of the big technical problems in such a high speed printer is the fixing nature to the record medium of ink. When fixing nature is bad, printing on the previous front face of a record medium is soiled, or the situation of the ink of the record medium with which the point was discharged at the rear face of a consecutive record medium in process in which the laminating of the consecutive record medium is carried out by the record-medium front face [finishing / printing] discharged previously adhering arises, and deterioration of printing grace and the fine sight of printed matter may be spoiled.

[0013] this invention is made in view of new technical knowledge which was described above, and it is in offering the ink-jet print method for obtaining a more nearly quality print using the ink-jet record technology using pigment ink and processing liquid.

[0014] Moreover, this invention is to offer the ink-jet print method which enables high-speed fixing to the record medium of ink, without spoiling the grace of a print object.

[0015] [Means for Solving the Problem] One embodiment of the ink-jet print method that the above-mentioned purpose can be attained in the ink-jet print method including the process which records a picture on a print medium (i) It has process, which makes the processing liquid which has reactivity with process, which makes ink adhere on a print medium using the ink-jet record method, and (ii) this ink adhere on this print medium. This process (i) is performed so that this ink and this processing liquid may touch in the state of a liquid on this print medium after this process (ii), this ink. The macromolecule dispersant for distributing the 1st pigment, 2nd pigment, and this 2nd pigment in an aqueous medium. Both *****, this 1st pigment, and this 2nd pigment are contained in this ink in the state of distribution. At least one anionic basis minds [this 1st pigment] direct or other atomic groups. It is the pigment of self-distributed type with which the pigment of self-distributed type combined with the front face of this 1st pigment, or the basis of at least one cation nature is combined with the front face of this 1st pigment through direct or other atomic groups. This 2nd pigment is a pigment which this aqueous medium can be made to distribute with a macromolecule dispersant, and this macromolecule dispersant is characterized including either [at least] the macromolecule dispersant of the basis combined with the front

face of this 1st pigment, and like-pole nature, or the macromolecule dispersant of Nonion nature.

[0016] Moreover, other embodiments of the ink-jet print method concerning this invention which can attain the above-mentioned purpose it is the ink-jet print method to a print medium. (i) -- the process, which gives the process; (ii) 2nd ink which gives the 1st ink to this print medium to this print medium -- and (iii) -- this -- the process which gives each of the 1st and 2nd ink and the processing liquid which reacts to this print medium -- It***, each of this 1st ink, this 2nd ink, and this processing liquid it is what is given so that each may contact in the state of a liquid in the front face of a print medium. This 1st ink At least one anionic machine minds [of a pigment particle] direct or other atomic groups. It is what contains the self-distributed pigment with through direct or other atomic groups in a water medium as the 1st pigment, this 2nd ink The 2nd pigment, The macromolecule dispersant for distributing this 2nd pigment is included in a water medium. It is what this 2nd pigment may distribute in this water medium with this macromolecule dispersant. This macromolecule dispersant contains either [at least] the macromolecule dispersant of the basis combined with the front face of this 1st pigment, and like-pole nature, or the macromolecule dispersant of Nonion nature. This processing liquid is characterized by performing this process (iii) in advance of this process (i) and this process (ii) including a polar compound opposite to the basis combined with the front face of this 1st pigment.

[0017] According to each mode concerning this invention which was described above, OD can be very high, and the more nearly high-definition picture by which "mist" was eased can be acquired, and various merits, such as improvement in scratch-proof nature and fixing nature, can be obtained.

[0018] Although the reason for the ability to acquire such an effect according to these embodiments is not clear, this invention persons are checking the following facts by much experiments which revolve this invention.

[0019] That is, if the ink which contains the 1st pigment and 2nd pigment in the portion which gave this processing liquid is given so that it may touch so that both may lap in the state of a liquid or after giving processing liquid to a print medium, an ink dot will spread comparatively greatly into the portion which gave processing liquid, and will turn into an ink dot which has a big bath.

[0020] if it considers that cohesive force is too strong and a big dot is hard to be formed at the reaction of the 2nd pigment and processing liquid — this — when the 1st and 2nd pigments live together in reaction time with processing liquid, it is guessed that condensation of the pigment by the reaction of processing liquid and a macromolecule dispersant is eased. That is, generating of the phenomenon in which reaction components, such as a high molecular compound in processing liquid, and the macromolecule dispersant in ink become entangled strongly. It is eased when the reaction component in the 1st pigment and processing liquid reacts, and intermolecular force with the 2nd still more powerful pigment in reaction mixture is eased by existence of the 1st pigment, and it is thought that it is easy to diffuse ink in the longitudinal direction of space as the result.

[0021] On the contrary, it is guessed that relief of the phenomenon of the "mist" observed by the reaction time of processing liquid and the 1st pigment is what is depended on the particle which is eased by the reaction of the high molecular compound in processing liquid and the 2nd pigment, or causes "mist" being enclosed by the reactant. Consequently, although the diameter of a dot becomes large, there is almost no generating of mist etc. and it is thought that edge sharpness becomes good.

[0022] Moreover, since the big diameter of a dot can be formed also in the few amount of ink as described above, it suits that it can do few, it waits for the macromolecule dispersant which becomes good [fixing nature] and is added in ink with use of the 1st pigment, and fixing nature will become much more good.

[0023] Moreover, in this mode, when processing liquid shall be excelled in the permeability over a print medium, fixing nature and the diameter of a dot become what was further excellent. This is

that the processing liquid which has permeability to a print medium spreads promptly, and it is considered because a big dot can be formed early in order to form the dot, while ink permeates, and it is easy to diffuse it and it reacts on a print medium front face, since a kind of ink absorbing layer is formed in the front face of a print medium.

[0024] Furthermore, in this mode, it is desirable to use the processing liquid which optimized the component corresponding to the kind and ratio of the 1st pigment in this ink and the 2nd pigment, when attaining much more high definition-ization, namely, a clothes moth with [as the self-distributed pigment was shown in drawing 3 (a) as 3001 as a model] the polar group (for example, anionic machine) of the shape of much mustache around a pigment particle -- it is thought that it has the chestnut-like gestalt. On the other hand, roughly, as 3003 showed to drawing 3 (b), the high molecular compound which has many cation nature machines in 1 molecule, for example, the poly allylamine, (PAA) is expressed, if such a compound is mixed with a self-distributed pigment, the macromolecule 3003 of PAA will get twisted around the circumference of the self-distributed pigment 3001 like drawing 4. However, it is thought that no the cation nature machine of PAA combines with anionic machines, consequently it is thought that the reactant of a self-distributed pigment and PAA becomes the gestalt of the state with cation nature on the whole. Thus, it is thought that the intermolecular force of that to which the small pigment particle and small PAA of particle size reacted is also weak, and it is easy to oppose electrically, and it is hard to condense to a bigger gestalt, and has become, consequently becomes the cause by which these minute objects make the circumference of a dot produce bleeding of the shape of slight mist. On the contrary, even if the macromolecule dispersant itself makes the compound which has many anionic machines or cation nature machines, and, on the other hand, has one cation nature machine or an anionic machine in a processing liquid side at one molecule contain in the case of the pigment which it comes to distribute with a macromolecule dispersant, it does not come to destroy the dispersibility of a macromolecule dispersant completely. Then, for example, the 1st pigment which the anionic machine combined with the pigment front face and the pigment distributed with the anionic macromolecule dispersant. By making the macromolecule cation nature compound and drawing 3 (c) like PAA as processing liquid to ***** Inc. contain a low-molecular cation compound like a benzalkonium chloride (EBK) shown in 3005 at a predetermined rate. The dispersibility of each pigment in ink is certainly destroyed on a print medium, and generation of the unreacted cation nature machine leading to MOYA can be suppressed as much as possible. Consequently, it enables OD for there to be no MOYA highly and to form the very high-definition picture excellent also in fixing nature on a print medium in short fixing time.

[0025] [Embodiments of the Invention] (Operation gestalt 1-1) The ink-jet recording method concerning 1 operation gestalt of this invention. The ink containing the 1st pigment and 2nd pigment, this ink, and the processing liquid that reacts, It ***** this processing liquid is first given to a print medium, subsequently to this print medium this ink is given, and the process which forms a picture dot is included by contacting this processing liquid and this ink in the state of a liquid, and making them react on this print medium.

[0026] (Ink) As an example of the ink which can be used for the above modes It is ink which contains the 1st pigment and the 2nd pigment in the state of distribution in an aqueous medium as a color material. At least one anionic basis minds [this 1st pigment] direct or other atomic groups. It is the pigment of self-distributed type with which the pigment of self-distributed type combined with the front face of this 1st pigment or the basis of at least one cation nature is combined with the front face of this 1st pigment through direct or other atomic groups. This 2nd pigment is a pigment which this aqueous medium can be made to distribute with a macromolecule dispersant or the macromolecule dispersant of Nonion nature. The ink which contains the macromolecule dispersant with which this ink contains either [at least] the macromolecule dispersant of the basis further combined with the front face of this 1st pigment and like-pole nature or the macromolecule dispersant of Nonion nature as a dispersant for distributing this 2nd pigment is mentioned. Hereafter, this ink is explained one by one.

[0027] (The 1st pigment) the pigment of self-distributed type is stabilized to the liquid which

mixed water, the water-soluble organic solvent, or these, maintains a distributed state, without using dispersants, such as a water-soluble-polymer compound, and points out a pigment which does not produce a pigment comrade's floc which causes trouble to the normal ink regurgitation from the orifice using ink-jet record technology in this liquid

[0028] (Anionic self-distribution CB) What combined at least one anionic machine with the pigment front face through direct or other atomic groups as such a pigment, for example is used suitably, and a concrete example contains the carbon black which at least one anionic machine has combined with the front face through direct or other atomic groups.

[0029] As an example of the anionic machine combined with such carbon black, -COOM, -SO3M, -PO3HM, and -PO3M2 grade (however, M in a formula expresses a hydrogen atom, alkali metal, ammonium, or organic ammonium) are mentioned, for example.

[0030] As an alkali metal of the above "M", a lithium, sodium, a potassium, etc. are mentioned and monochrome or triethyllumonium, monochrome or triethyl ammonium, monochrome, or TORMETERA Norian ammonium is mentioned as organic ammonium of "M", for example.

[0031] In these anionic machines, since especially -COOM and -SO3M have the large effect of stabilizing the distributed state of carbon black, they are desirable.

[0032] By the way, as for the above-mentioned various anionic machines, it is desirable to use what was combined on the surface of carbon black through other atomic groups. As other atomic groups, the naphthylene machine which is not replaced [the phenylene group which is not replaced / the shape of a straight chain of the carbon atoms 1-12, a branched-chain alkylene machine substitution, or / substitution, or] is mentioned, for example. As an example of the substituent which may be combined with the phenylene group or the naphthylene machine here, the shape of a straight chain, a branched-chain alkyl group, etc. of carbon numbers 1-6 is mentioned.

[0033] As an example of the anionic machine combined on the surface of carbon black through other atomic groups, although -C2H4COOM, -PhSO3M, -PhCOOM, etc. are mentioned (however, Ph expresses a phenyl group), of course, it is not limited to these, for example.

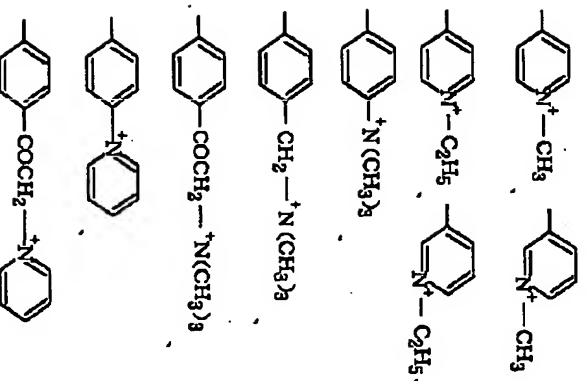
[0034] The carbon black which combined with the front face an anionic machine which was described above through direct or other atomic groups can be manufactured by the following methods.

[0035] That is, the method of oxidizing commercial carbon black by sodium hypochlorite is mentioned as a method of introducing -COONa into a carbon black front face.

[0036] Moreover, for example, as a method of combining -Ar-COONa basis (however, Ar expressing an aryl group) with a carbon black front face, although the method of making the diazonium salt which made the nitrous acid act on a NH2-Ar-COONa basis, and combining with a carbon black front face is mentioned, of course, this invention is not necessarily limited to this.

[0037] (Cation nature self-distribution CB)

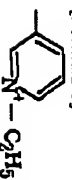
(Cation nature electrification CB) What combined at least one chosen from the 4th class ammonium shown below on the surface of carbon black as carbon black charged to cation nature is mentioned. The class [4th] ammonium: -NH3+, -NR3+, -SO2NH2, -SO2NHCOAR, [0038] [Formula 2]



R shows the naphthyl group which is not replaced [the phenyl group which is not replaced / the shape of a straight chain of carbon numbers 1-12, a branched-chain alkyl group substitution, or /, substitution, or] among the above-mentioned formula. As a phenyl group or a substituent of a naphthyl group, the shape of a straight chain, a branched-chain alkyl group, etc. of carbon numbers 1-6 is mentioned here.

[0039] As a method of manufacturing the self-distributed carbon black which a hydrophilic radical which was described above was combined and has been charged to cation nature, it is N-ethyl pyridyl machine [of the structure shown below]. [0040], for example.

[Formula 3]



If it explains taking the case of the method of making it ***** (ing), the method of processing carbon black with a 3-amino-N-ethyl plus JIJU star's picture will be mentioned. Thus, the carbon black which electrified anionic or cation nature by introduction of the hydrophilic radical on the front face of carbon black maintains the distributed state stabilized even if it did not add a dispersant etc. when it was made to contain in water color ink since it had water-dispersion [which was excellent with rebounding of ion].

[0041] When combining a cation nature machine on the surface of a pigment, even if it makes a cation nature machine couple directly with a pigment, you may make it join together through an atomic group. What was illustrated as what can be used as an atomic group in the case of making it join together through an atomic group when combining an anionic machine previously can be illustrated also here.

[0042] By the way, as for especially the pigment (the 1st pigment) of self-distributed type that the ink concerning this operation gestalt is made to contain, it is desirable that the 80 0.05-0.3-micrometer% or more shall be the thing of the particle size which is 0.1-0.25 micrometers. The adjustment method of such ink is as having explained in full detail in the example mentioned later.

[0043] (The 2nd pigment) As for the 2nd pigment which can be used for the ink of this operation

gestalt, the dispersion medium of ink and the pigment which can specifically be distributed by operation of a macromolecule dispersant to an aqueous medium are mentioned. That is, the pigment which the front face of a pigment particle may be made to distribute stably to an aqueous medium for the first time as a result to which the macromolecule dispersant stuck is used suitably. And as such a pigment, carbon black pigments, such as furnace black, lamp black, acetylene black, and channel black, are mentioned, for example as black pigment, for example. As an example of such a carbon black pigment, it is independent, or the following can be combined suitably and can be used, for example.

Carbon black pigment : - Raeburn (Raven) 7000, Raeburn 5750, Raeburn 5250, Raeburn 5000ULTRA, Raeburn 3500, Raeburn 2000, Raeburn 1500, Raeburn 1250, Raeburn 1200, Raeburn 1190 ULTRA-II, Raeburn 1170, Raeburn 1255 (above made in Colombia) - Black PARUZU(Black Pearls) L, legal (Regal) 400R, Legal 330R, Legal 660R, Mogul L (Mogul) MONAKU (Monarch) 700, MONAKU 800, MONAKU 880, MONAKU 900, MONAKU 1000, MONAKU 1100, MONAKU 1300, MONAKU 1400, VARUKAN (Valcan) XC-72R (above Cabot Corp. make)

- The color black (Color Black) FW1, the color black FW2, color black FW2V, the color black 18, the color black FW200, the color black S150, the color black S160, the color black S170, the pudding tex (Printex) 35, the pudding tex U, the pudding tex V, pudding tex 140U, pudding tex 140V, the special black (Special Black) 6, the special black 5, special black 4A, special black 4 - No.25, No.33, No.40, No.47, No.52, No.900, No.2300, MCF-88, MA600, MA7, MA8, MA100 (above Mitsubishi Chemical make).

[0044] As other black pigment, magnetic-substance particles, titanium blacks, etc., such as a magnetite and a ferrite, can be mentioned.

[0045] Moreover, blue pigment, red pigments, etc. can be used in addition to the black pigment described above.

[0046] this --- the amount of the color material which set the 1st and 2nd pigments is 1 - 10 % of the weight more preferably 0.1 to 15% of the weight to the ink whole quantity 5/ of ratios of the 1st pigment and the 2nd pigment is depended 95 - 97/3, and its range of 10 / 90 - 95/5 is preferably desirable. It is the 1st pigment / 2nd pigment - 50 / 1 - 4/6 still more preferably.

further --- ***** --- another range is a range with many 1st pigment When there are many such 1st pigments, stability including the reliability by there being little wetting of the regurgitation stability, especially regurgitation efficiency of a head, or a delivery side is demonstrated as well as the distributed stability as ink.

[0047] Moreover, since ink spreads on the surface of paper effectively, the ink with few 2nd pigment as behavior of the ink in the paper to which the macromolecule dispersant stuck is presumed that the uniform thin film by the macromolecule dispersant is formed in a front face, and its scratch-proof nature of a picture also improves according to the effect.

[0048] It sticks to the macromolecule dispersant for making an aqueous medium distribute the 2nd pigment on the front face of the 2nd pigment, and what has the function for it to be stabilized to an aqueous medium and to make it distribute the 2nd pigment is used suitably. As an example of such a macromolecule dispersant, an anionic macromolecule dispersant, a cation nature macromolecule dispersant, and a Nonion nature macromolecule dispersant are mentioned.

[0049] (Anionic macromolecule dispersant) The polymer of the monomer as a hydrophilic radical and the monomer as a hydrophobic radical, its salt, etc. are mentioned. As an example of the monomer as a hydrophilic radical, a styrene sulfonic acid, alpha, beta-ethylene nature unsaturated carboxylic acid, alpha, beta-ethylene nature unsaturated-carboxylic-acid derivative, an acrylic acid, an acrylic-acid derivative, a methacrylic acid, a methacrylic-acid derivative, a maleic acid, a maleic-acid derivative, an itaconic acid, an itaconic-acid derivative, a fumaric acid, a fumaric-acid derivative, etc. are mentioned, for example.

[0050] Moreover, as an example of the monomer as a hydrophobic component, styrene, a styrene derivative, vinyltoluene, a vinyltoluene derivative, vinyl naphthalene, a vinyl naphthalene derivative, a butadiene, a butadiene derivative, an isoprene, an isoprene derivative, ethylene, an ethylene derivative, a propylene, a propylene derivative, the alkyl ester of an acrylic acid, the alkyl ester of a methacrylic acid, etc. are mentioned, for example.

[0051] In addition, a salt is not limited to these here, although onium compounds, such as hydrogen, alkali metal, an ammonium ion, an organic ammonium ion, phosphonium ion, sulfonium ion, an oxonium ion, stibonium ion, SUTANNONIUM, and iodonium, etc. are specifically mentioned. Moreover, you may add suitably a polyoxyethylene machine, a hydroxyl group, an acrylamide, an acrylamide derivative, dimethylaminoethyl methacrylate, ethoxy ethyl methacrylate, butoxyethylmethacrylate, ethoxytriethylene methacrylate, methoxy polyethylene-glycol methacrylate, a vinyl pyrrolidone, a vinylpyridine, vinyl alcohol, alkyl ether, etc. to the above-mentioned polymer or its salt.

[0052] (Cation nature macromolecule dispersant) as cation nature powder — the third class amine monomer and these — class [the / 4th]-izing — the copolymerization object of a thing and a hydrophobic monomer etc. is used the bottom As the third class amine monomer, N and N-dimethylaminoethyl methacrylate, N- and N'-dimethyl acrylamide etc. is used, for example. Styrene, a styrene derivative, vinyl naphthalene, etc. are used as a hydrophobic monomer. Moreover, as a compound for forming a salt in the case of tertiary amine, a sulfuric acid, an acetic acid, a nitric acid, etc. are used. Moreover, what was formed into 4 class by the methyl chloride, the dimethyl sulfate, etc. can be used.

[0053] (Nonion nature macromolecule dispersant) The example of a Nonion nature macromolecule dispersant contains a polyvinyl pyrrolidone, a polypropylene glycol, a vinyl-pyrrolidone-vinyl acetate copolymer, etc.

[0054] Although the ink of this mode can be obtained by the 1st pigment's, 2nd above-mentioned pigment's, and above-mentioned macromolecule dispersant's choosing the combination suitably, and making it distribute and dissolve in an aqueous medium In using the pigment of self-distributed type with which at least one anionic basis is combined on the surface of the pigment through direct or other atomic groups as the 1st pigment By making a macromolecule dispersant contain at least combining one side chosen from an anionic macromolecule dispersant and the macromolecule dispersant of Nonion nature, the stability of good ink is securable. Moreover, in using the pigment of self-distributed type with which the basis of at least one cation nature is combined by the same reason on the surface of the pigment through direct or other atomic groups as the 1st pigment, it combines with this 1st pigment at least one side chosen from the macromolecule dispersant of cation nature, and the macromolecule dispersant of Nonion nature as a macromolecule dispersant.

[0055] The rate in the inside of the ink of the 2nd pigment and the macromolecule dispersant which distributes it is a weight ratio, and 5.0:5-5:2 are desirable.

[0056] (Aqueosity medium) As an aqueosity medium used as the dispersion medium of the pigment of the 1st and 2, you may use the water-soluble organic solvent other than water. As this water-soluble organic solvent, for example Methyl alcohol, ethyl alcohol, n-propyl alcohol, isopropyl alcohol, n-butyl alcohol, sec-butyl alcohol, tert-butyl alcohol, isobutyl alcohol, Alkyl alcohols of the carbon numbers 1-5, such as n-pentanol; A dimethylformamide, Amides, such as a dimethylacetamide; Ketones, such as an acetone and diacetone alcohol, or a keto-alcohols; tetrahydrofuran, Ether, such as a dioxane; A diethylene glycol, a triethylene glycol, A tetraethylene glycol, a dipropylene glycol, tripropylene glycol, Oxyethylene or oxypropylene copolymers, such as a polyethylene glycol and a polypropylene glycol, Ethylene glycol, A propylene glycol, a trimethylene glycol, a triethylene glycol, The alkylene glycol, glycerol in which alkylene machines, such as 1, 2, and 6-hexane triol, contain 2-6 carbon atoms; The ethylene glycol monomethyl (or ethyl) ether, Low-grade alkyl ether, such as the diethylene-glycol monomethyl (or ethyl) ether and the triethylene-glycol monomethyl (or ethyl) ether; The triethylene-glycol dimethyl (or ethyl) ether, Low-grade dialkyl ether of polyhydric alcohol, such as the tetraethylene-glycol dimethyl (or ethyl) ether, A monoethanolamine, Alkanolamines, such as a diethanolamine and a triethanolamine; sulfolane, N-methyl-2-pyrrolidone, 2-pyrrolidone, 1, and 3-dimethyl-2-imidazolidinone etc. is mentioned. These water-soluble organic solvents can be used also as mixture, even if independent. And when the drying property of the ink on a record medium, the solubility of the various components in ink, and the stability of dispersibility are taken into consideration, it is one of the desirable modes to use together two or more kinds of water-soluble organic solvents, as indicated in the example mentioned later.

(Permeability to the record medium of ink) this operative condition containing the various components explained above — ink [like] When Ka value is adjusted to under one (1ml-m-2 and msec-1/2) paying attention to the permeability over a print medium, have very uniform concentration by the combined use with the processing liquid mentioned later, and an edge is sharp. And the picture dot excellent in the fixing speed and fixing nature to a print medium can be obtained. The permeability over the print medium of ink is explained below.

[0057] It is the permeability of ink 1m 2 If expressed with the amount V of ink of a hit, it is known that the amount V of ink osmosis in the time t after breathing out an ink drop (a unit is a milliliter /m2=mm) is expressed by the Bristow method as shown below.

[0058]

[Equation 1]

$$V = V_r + K_a (t - t_w)^{1/2}$$

(However, t-tw) Immediately after an ink drop trickles into a print medium front face, it is most that an ink drop is absorbed in a surface concavo-convex portion (portion of the granularity of the front face of a print medium), and the interior of a print medium is hardly permeated. Time in the meantime is [the absorbed dose to tw (wet time) and the concavo-convex section in the meantime] Vr. If the elapsed time after dropping of an ink drop exceeds tw, the amount V of osmosis will increase only the part proportional to the 1/2nd power of the time (t-tw) which exceeded. Ka is the proportionality coefficient of this increment and shows the value according to osmosis speed.

[0059] Ka value was measured using the dynamic permeability testing device S of the liquid by the Bristow method (made in an Oriental energy machine factory). In this experiment, PB form of Canon, Inc. which is these people was used as a print medium (recording paper). This PB form is the recording paper which can be used for the both sides of the copying machine and LBP which used the electrophotography method, and the print using the ink-jet recording method.

[0060] Moreover, the same result was able to be obtained also to the PPC form which is an electrophotography form of Canon, Inc.

[0061] Ka value is decided by the kind of surfactant, the addition, etc. For example, ethyleneoxide - Permeability becomes high by adding a nonionic surfactant called 2, 4, 7, the 9-tetramethyl-5-crepe de Chine -4, and 7-diol (ethylene oxide-2, 4 and 7, 9-tetramethyl-5-deven-4, 7-diol) (It writes with a trademark "ASECHIRE Norian" (Kawaken Fine Chemicals Co., Ltd. make) hereafter).

[0062] Moreover, when it is ink (a content rate is 0%) with which ASECHIRE Norian is not mixed, permeability is low and has a property as addition system ink specified later. Moreover, when ASECHIRE Norian is mixed at 1% of a content rate, it has the property which permeates the interior of the recording paper for a short time, and has a property as hypertonicity ink specified later. And the ink with which ASECHIRE Norian is mixed at 0.35% of a content rate has a property as both middle half-permeability ink.

[0063]

[Table 1]

	Ka 値 [ml/(m ² ・msec ^{1/2})]	アチノール含有 量 (%)	表面張力 (dyne/cm)
上乗せ系インク	1 未満	0 以上 0.2 未満	40 以上
半浸透性インク	1 以上 5 未満	0.2 以上 0.7 未満	36 以上
両浸透性インク	5 以上	0.7 以上	40 未満

The above-mentioned table 1 shows Ka value, an ASECHIRE Norian content, and surface tension (dyne/cm%) about each of "addition system ink", "half-permeability ink", and "hypertonicity ink." What has Ka value large [the permeability of each ink to the recording paper which is a print medium] becomes high. That is, what has small surface tension becomes high.

[0064] Ka value in Table 1 is measured using the dynamic permeability testing device S of the

liquid by the Bristow method (made in an Oriental energy machine factory) like the above-mentioned, PB form of above-mentioned Canon, Inc. was used for the experiment as a record form. Moreover, the same result was able to be obtained also to the PPC form of above-mentioned Canon, Inc.

[0065] Here, an ASECHIRE Norian content rate is 0.7% or more, and the ink of the system specified as "hyperionicity ink" is the thing of the range from which the good result was obtained about permeability. And as criteria of the permeability which the ink of this embodiment is made to support, it is desirable to carry out to under Ka value of "addition system ink", 1.0 [i.e.,] (ml-m-2 and msec-1/2), and below 0.4 (ml-m-2 and msec-1/2) is especially desirable.

[0066] (Addition of a color) You may add a color further in the above-mentioned ink of a mode. Namely, the ink which added the color further to the ink containing the dispersant for making an aqueous medium distribute the 1st pigment, the 2nd pigment, and the 2nd pigment can form the picture dot which was more excellent with the combined use with the processing liquid mentioned later on a print medium in short fixing time. Moreover, although it is as having stated previously that the cohesive force of the 2nd pigment is eased by existence of the 1st pigment, it is eased by one more step of addition of a color, and the cohesive force of the 2nd pigment is considered that the absorptivity of ink can suppress effectively the uniformity of print pictures, such as a "crack" etc. which is easy to produce in a bad record medium as compared with a regular paper etc., by it. It is desirable to adopt the color of the polarity of a basis and like-pole nature which for example, the anion color and the cationic dye were mentioned as a color which can be used here, and has been preferably combined with the front face of the 1st pigment.

[0067] (An anion, cationic dye) As a meltable anion color, well-known acid dye, a substantivity color, a reactive dye, etc. are suitably used to the aqueous medium which can be used with this operation gestalt which was described above. Moreover, basic dye well-known as a cationic dye is used suitably. Moreover, it is good that both color uses especially the color which has JISUAZO or a tris azo skeletal structure as a skeletal structure preferably. Furthermore, it is also desirable that it is with two or more sorts of colors from which a skeletal structure differs. You may use colors, such as cyanogen, a Magenta, and yellow, in the range from which a color tone does not differ greatly as a color to be used except a black color.

[0068] (Addition of a color) Although 5 % of the weight - 60% of the weight of the whole color material is sufficient, when it takes into consideration utilizing more effectively the effect of having mixed the 1st and 2nd pigments as an addition of a color again, it is desirable to consider as less than 50 % of the weight. Furthermore, when considering as the ink which usually thought the printing property in the paper as important, it is desirable to consider as 5 % of the weight - 30 % of the weight.

[0069] (Processing liquid) Next, if the basis which it comes to combine with the front face of the 1st pigment in ink, for example is anionic as an example of the processing liquid which can be used for the above-mentioned mode, the processing liquid containing the compound which has an anionic machine and the cation nature machine which reacts will be used suitably. Moreover, if the basis which it comes to combine with the front face of the 1st pigment is a cation nature machine, the processing liquid containing the compound which has a cation nature machine and the anionic machine which reacts will be used suitably.

[0070] For example, as a cation nature compound, the cation nature compound of the amount of comparison-macromolecules which has a cation nature machine in [about one] a molecule and which has two or more the cation nature compounds and cation nature machines of low molecular weight in 1 molecule comparatively is mentioned. As a cation nature compound of low molecular weight, comparatively For example, the 1st class, the 2nd class, or a tertiary amine salt type compound. Specifically Hydrochlorides, such as a lauryl amine, a coconut amine, a stearyl amine, and a rosin amine. On the compound of a quaternary-ammonium-salt type besides being acetate etc., and a concrete target, lauryl trimethylammonium chloride, lauryldimethyl benzyl ammoniumchloride, benzyl tributyl ammoniumchloride. There are a benzalkonium chloride, cetyl trimethylammonium chloride, etc. On a pyridinium-salt type compound and a concrete target, cetyl pyridinium chloride, a cetyl pyridinium star's picture, etc.

furthermore, further There is 2-heptadecenyl-hydroxyethyl imidazoline etc. in an imidazoline type cation nature compound and a concrete target, and it is further mentioned to the ethylene oxide addition product of the second class alkylamine, and a concrete target as an example with desirable dihydroxyethyl stearyl amine etc.

[0071] Furthermore, by this invention, the amphoteric surface active agent which shows cation nature in a certain pH field can also be used, specifically, there is an amino acid type amphoteric surface active agent and RNHCH₂-CH₂COOH type compound, and a betaine type compound, for example, a stearyl dimethyl betaine, a lauryl dihydroxyethyl betaine, etc. are mentioned. It is desirable to take the method of whether processing liquid is adjusted so that it may be set to pH below those isoelectric points, in, using these amphoteric surface active agents, of course, or to adjust so that it may be set to pH below this isoelectric point, when it mixes with ink on a record medium. Next, as a macromolecule component of the cation nature matter, the neutralization object or partial neutralization objects by the acid, such as the poly alkylamine, a polyamine sulfone, a polyvinyl amine, chitosan and these hydrochloric acids, and an acetic acid, can be mentioned.

[0072] Moreover, for example, an anionic surfactant, etc. can be used as an anionic compound. As an example of an anionic surfactant, what is generally used can use a carboxylate type, a sulfate type, a sulfonate type, a phosphoric-ester type, etc. Moreover, as an example of an anionic macromolecule, although an alkali meltable type resin, the thing which copolymerized the acrylic acid can specifically be mentioned to a part of sodium polyacrylate or macromolecule, of course, it is not limited to these. More specifically For example, sulfo succinic-acid lauryl disodium, sulfo succinic-acid polyoxyethylene lauryl ethanol AMIDESUTERU disodium, Polyoxyethylene alkyl sulfo succinic-acid disodium, carboxylation polyoxyethylene lauryl ether sodium salt, Carboxylation polyoxyethylene lauryl ether sodium salt, Polyoxyethylene lauryl etheral-sulfate sodium, a polyoxyethylene lauryl etheral-sulfate triethanolamine. Although a polyoxyethylene-alkyl-ether sodium sulfate, a polyoxyethylene-alkyl-ether sodium sulfate, sodium alkylsulfate, an alkyl-sulfuric-acid triethanolamine, etc. are mentioned, it is not necessarily limited to these.

[0073] The water, the water-soluble organic solvent, and the other additives other than the KAOCHIN nature matter mentioned above as a component of others which constitute the aforementioned processing liquid, or the anionic matter may also be included. As a water-soluble organic solvent, amides, such as a dimethylformamide and a dimethylacetamide Ether, such as ketones, such as an acetone, a tetrahydrofuran, and a dioxane, Polyalkylene glycols, such as a polyethylene glycol and a polypropylene glycol Ethylene glycol, a propylene glycol, a butylene glycol, A triethylene glycol, 1 and 2, 6-hexane triol, a thiodiglycol, Alkylene glycol, such as a hexylene glycol and a diethylene glycol An ethylene glycol methyl ether, the diethylene-glycol monomethyl ether. The low-grade alkyl ether of polyhydric alcohol, such as the triethylene-glycol monomethyl ether Others [monohydric alcohol /, such as ethanol, isopropyl alcohol n-butyl alcohol, and isobutyl alcohol,], A glycerol, a N-methyl-2-pyrrolidone, 1, 3-dimethyl indazolidinone, a triethanolamine, a sulfolane, a dimethyl SARHOKI side, etc. are used. Although there is especially no limit about the content of the above-mentioned water-soluble organic solvent, it is a range with 5 - 40 % of the weight it is still more desirable and suitable five to 60% of the weight of a processing **** weight.

[0074] And in this mode, as for this processing liquid, it is desirable to adjust so that it may have high permeability to a print medium, when aiming at improvement in the fixing speed to the print medium of a picture dot, and the improvement of fixing nature.

[0075] Fundamentally, if the grant sequence to the print medium of the ink in this operation gestalt and processing liquid is the sequence that it precedes giving ink to a print medium and processing liquid is given as mentioned above, it can acquire the predetermined effect mentioned above.

[0076] It is contained in the range of this invention, when above-mentioned sequence is realized by the scan of the multiple times to the same field which sandwiched the ejection, respectively, if it is concerning the concrete composition which defines this grant sequence when using the head of a serial type.

[0077] As mentioned above, although the ink of this operation gestalt is succeeding given to the grant to the print medium of processing liquid, it is not limited to one drop which has been mentioned above as the number of grants of this ink.

[0078] For example, the 1st pigment can make conversely the ink which the ink given by being good also as what gives two drops of ink, succeeding to grant of processing liquid, and preceding in these two drops preferably in that case has more rates of the 2nd pigment than the 1st pigment, and is given after that what has more rates than the 2nd pigment.

[0079] When giving two or more drops of ink as mentioned above, and giving one drop for the total amount of the ink given, it is desirable to make it almost equal. If it puts in another way, when according to the operation form of this invention dividing into plurality and giving ink, even if the amount of each drop decreases according to the number of partitions, the predetermined effect mentioned above can be acquired.

[0080] Next, as long as each effect of this operation gestalt fundamentally mentioned above shows up like the grant sequence mentioned above, no matter the time difference to which the processing liquid and ink in this operation gestalt are given may be what time difference, it is contained within the limits of this invention.

[0081] That is, the reaction of mixed ink and processing liquid is produced in various modes by time after processing liquid is given until ink is given. For example, even when the above-mentioned time is short, it is also observed that sufficient reaction of a pigment etc. and processing liquid is produced and each effect of this operation form and the effect which suppresses "mist" especially may be produced at least, the circumference section, i.e., the edge section, of the dot in which they put and are formed.

[0082] From such a point, on these specifications, the distributed state of the pigment in ink destabilizes the "reaction" of ink and processing liquid, and it includes the case where a pigment produces condensation, a deposit, or thickening of ink, by contact in ink and processing liquid. And this "reaction" is included, not only when the whole drop of ink and the whole drop of processing liquid which were given to the record medium are mixed, but when the edge section of each drop contacts and the above-mentioned phenomenon arises.

[0083] Moreover, the case where the component of the processing liquid with which, as for "touching in the state of a liquid", the ink and processing liquid in this invention permeated the record intermediation inside of the body, and the ink succeeding performed to grant of this processing liquid react is also included.

[0084] The hue (kind), the concentration, and those number of the ink given with this operation gestalt are combinable with arbitration, as long as it follows in order of the grant mentioned above. For example, as a kind of ink, generally black (Bk), yellow (Y), a Magenta (M), and cyanogen (C) can be used, and ** and light ** can be used about each [these] color. You may still more specifically be the composition which starts this operation gestalt in at least one of yellow ink, Magenta ink, and the cyano ink and which considers as the ink containing the 1st pigment and 2nd pigment, uses processing liquid for this, and is given in this sequence.

[0085] The most desirable gestalt in such a combination that can apply this invention uses the ink concerning this embodiment as black ink. It is because each effect of these operation gestalts, such as OD value increase and suppression of "mist", can contribute most effectively to the print grace of characters, such as a character, according to this gestalt.

[0086] moreover, the method of giving these ink and processing liquid to a print medium -- each -- although various things, such as the method of contacting a method, ink, etc. which are applied independently to a direct print medium, and giving them, can be considered and any grant method is the thing of this invention within the limits -- most -- ***** -- a gestalt is the thing of an ink-jet method which used the print head And the combination of a print head and its array as the regurgitation section can be defined in this case according to the combination of the kind of ink including the grant sequence and processing liquid which were mentioned above.

[0087] The above-mentioned grant sequence etc. becomes possible by composition of specifically arranging the head of ink and processing liquid in the direction to which a print head moves relatively to a print medium.

[0088] Furthermore, grant of the above-mentioned ink which both [which arranged the ink

delivery in the range corresponding to full / of the print field in the print medium of such composition conveyed] the so-called full multi-type of print head and the print head of the serial type which performs movement for a scan to a print medium require for this invention, and processing liquid is enabled more as concrete composition.

[0089] Moreover, as an ink regurgitation method of these print heads, although anything of well-known methods, such as a piezo method, is employable, the most desirable gestalt is the thing of the method which is made to produce a foam in ink or processing liquid using heat energy, and carries out the regurgitation of ink or the processing liquid with the pressure of this foam.

[0090] Furthermore, since the range which ink and processing liquid are breathed out by each print head, and laps by it is usually controlled by the pixel unit which constitutes a print picture etc., the above-mentioned ink etc. is breathed out by the same position and piled up. However, application of this invention is not restricted to such composition. For example, the part and processing liquid of a dot of ink lap, processing liquid is thinned out and given to the composition which the predetermined effect of this operation gestalt produces, and the data of each pixel, and the composition to which the processing liquid which flows by blot etc. from a contiguity pixel, a pigment, etc. react is also included in the range of this invention.

[0091] (Operation gestalt 1-2) Other operation gestalts of this invention are explained below. [0092] This operation gestalt makes [of permeability] processing liquid high in the operation gestalt mentioned above, and aims at much more high-speed fixing by this.

[0093] High-speed fixing is the main composition for improvement in the speed of print speed, i.e., the improvement in a throughput. By gathering the drive frequency of a print head, and the bearer rate of a print medium, the improvement in a throughput is directly possible. However, if subsequent handling is inconvenient and is in the composition which carries out the laminating of the print medium to which paper was delivered when the ink on the print medium by which the print was completed and paper was delivered to it etc. has not been established, other print media may be soiled in non-established ink.

[0094] That is, in the various factors which contribute to improvement in the speed of this print speed, what is recollected directly is a speed to which the print medium which the print completed is delivered as mentioned above, and, therefore, this is in the bearer rate of a print medium, or the scan speed of a print head. That is, a scan speed will be connected with the delivery speed of the print medium which the print completed as a result if the bearer rate of the print medium in print operation means delivery speed as it is if it is in the equipment using the so-called full multi-type of print head, and it is in the equipment using the print head of a serial type. And the bearer rate of the above-mentioned print medium etc. correlates with the ink regurgitation period to a pixel through the resolution, i.e., the dot density, of a print. That is, if it is in the composition which prints one pixel in the ink breathed out from two or more print heads, when fixing and considering the above-mentioned resolution, a regurgitation period, the above-mentioned bearer rate, etc. to the pixel correlate.

[0095] In this operation form, even when what has an osmosis speed small as mixed ink is especially adopted by using the processing liquid which has a big osmosis speed for the improvement in OD value etc., comparatively quick fixing is attained.

[0096] (Processing liquid selectivity) Although composition of processing liquid is as having explained previously, it is desirable to optimize composition of processing liquid according to the kind and amount of the 1st pigment in ink, the 2nd pigment, and a macromolecule dispersant when enjoying the effect which this invention brings about to the maximum extent. An example is given and explained below about this point.

[0097] A benzalkonium chloride (EBK) and the processing liquid which contains the poly allylamine (PAA) as macromolecule cation nature compounds were prepared as the self-dispersibility carbon black which combined the anionic machine with the front face as the 1st pigment, the general carbon black as the 2nd pigment, the ink which contains a styrene-acrylic-acid-ethyl-acrylate copolymer (acid number 180, average molecular weight 12000) as a macromolecule dispersant, and a low-molecular cation nature compound. And when the ratio of EBK and PAA in processing liquid was fixed to (PAA:3.6 % of the weight and EBK:0.5% of the weight) and the ratio of the self-dispersibility carbon in ink and usual carbon black was changed,

the property of the picture acquired was evaluated (in addition, the amount of a macromolecule dispersant was made to fluctuate corresponding to the change in the amount of usual carbon black).

[0098] Drawing 5 (A) is the graph which showed roughly change of OD of the picture acquired when composition of processing liquid is fixed and the weight ratio of the 1st pigment in ink and the 2nd pigment is changed. When the rate of the 1st pigment and the 2nd pigment is a predetermined value so that this graph may show, OD shows the maximum.

[0099] change of OD (back omission OD) which measured the picture acquired when drawing 5 (B) fixes composition of processing liquid and the weight ratio of the 1st pigment in ink and the 2nd pigment is changed from the background of a print medium — measuring — too — the 1st pigment and the 2nd pigment — comparatively — ** — it turns out that correlation is between the back omissions OD

[0100] Next, the ratio of EBK and PAA in processing liquid was changed, and the same experiment was conducted. Consequently, although OD falls as a general trend when EBK is increased, OD does not fall so much by containing PAA. However, OD becomes high, so that the ratio of a self-distributed pigment is high, even when the rate of EBK is increased. EBK takes fixing time for increasing and it becomes early. Moreover, it becomes early as self-distributed pigments increase in number.

[0101] It is presumed that a close relation between PAA and macromolecule dispersant distribution carbon black and between EBK and self-distributed carbon black is from this fact. This is considered to be explained by the following presumed mechanisms. That is, as it said previously that a self-distributed pigment expresses typically, it has a form as shown in drawing 3 (a), and PAA which is a cation macromolecule is the matter of the shape of a string with the cation machine of plurality [inside / of 1 molecule] like drawing 3 (b). If a self-distributed pigment and PAA are mixed when only PAA is contained into processing liquid here, the macromolecule of PAA will get twisted around the circumference of a self-distributed pigment like drawing 4. However, since the cation machine of PAA is difficult to combine with the anion machine of all pigments geometrically, it is thought that it is the form of the state with cation nature which was combined like drawing 4 on the whole. In other words, the dispersibility of a pigment will be in the state where it is not fully destroyed. And if surrounded by the circumferences, such as a pigment particle detailed in ink, with a cation machine, the electric repulsive force will act strongly rather than intermolecular force, condensation of detailed pigment particles is barred, and the inclination which permeates the interior rather is promoted rather than it remains on the front face of a print medium. Consequently, it acts in the direction which bars improvement in OD or edge sharpness. If EBK of a form as shown in drawing 3 (c) by 3005 here exists in processing liquid, the reaction of self-distributed carbon black and PAA will turn into competitive reaction with the reaction of self-distributed carbon black and EBK, and the rate which the joint object of self-distributed carbon black and PAA generates will fall. On the other hand, with the 2nd pigment, the macromolecule dispersant adhering to the front face and PAA in processing liquid become easy to twine. Consequently, the dispersibility of the pigment in ink is fully destroyed and a pigment becomes easy to remain in a print medium front face. Therefore, it is thought that OD and edge sharpness improve.

[0102] When the processing liquid which made the ratio of the poly allylamine and a benzalxonium chloride (PAA:3.6%, EBK:0.5%) to the ink which more specifically set to 1:1 the ratio of self-distributed carbon black and the carbon black distributed with a macromolecule dispersant, and was made into high permeability is combined, while excelling in fixing nature, the picture excellent in especially edge sharpness can be acquired.

[0103] Moreover, when the processing liquid which made the ratio of the poly allylamine and a benzalxonium chloride (PAA:0.5%, EBK:4%) to the ink which set to 9:1 the ratio of self-distributed carbon black and the carbon black distributed with a macromolecule dispersant, and was made into high permeability is combined, the picture which was especially compatible in high-speed fixing nature and the outstanding picture grace can be acquired. In addition, the fact that the viscosity of the reaction mixture by that there are few high molecular compounds in processing liquid and there being few macromolecule dispersants also in ink is small etc. is cited as a reason

this mode can attain coexistence of high-speed fixing and high picture grace.

[0104] Operation form 2) although the operation form of the above 1st mainly explained the form using the ink containing the 1st pigment and the 2nd pigment — this — the form which made separate ink contain the pigment of 1 and the 2nd pigment is also the thing of the criteria of this invention

[0105] Operation form 2-1) This mode is given so that each may contact the 1st ink containing the 1st pigment, the 2nd ink containing the 2nd pigment, and this 1st row in the state of a liquid on a print medium front face with the 2nd ink in the processing liquid which reacts. And then in advance of the grant to the record medium of the 1st ink and the 2nd ink, this processing liquid can be given, and an effect almost equivalent to the various effects of this invention described above by this can be acquired.

[0106] [Example] Although the example of this invention is explained in detail, referring to drawing, this invention can combine not only an example such but these further, or can apply them also to the technology of other fields which connote the same technical problem.

[0107] (Example 1-1) Drawing 6 is the side elevation showing the outline composition of the full line type print equipment concerning the 1st example. The ink-jet print method which prints by breathing out ink or processing liquid from the print head (*****) of two or more full line types arranged in the predetermined position along the conveyance direction (the inside of this drawing, the direction of arrow A) of the record medium as a print medium is used for this print equipment 1, it is controlled by the control circuit of drawing 7 mentioned later, and operates.

[0108] 101g of head groups — each — the cross direction (direction perpendicular to the space of drawing) of the recording paper 103 with which each of print head 101S, 101BK, and 101C, 101M and 101Y is conveyed in the direction of A in drawing — about 7200 ink deliveries — arranging — a maximum of — it can print to the recording paper of A3 size The recording paper 103 is conveyed by rotation of the resist roller 114 of the couple driven by the motor for conveyance in the direction of A, and after the guide plate 115 of a couple shows around and register doubling at the nose of cam is performed, it is conveyed with the conveyance belt 111.

The conveyance belt 111 which is an endless belt is held with two rollers 112 and 113, and bias of the vertical direction of the top portion is regulated by the platen 104. The recording paper 103 is conveyed by the rotation drive of the roller 113 being carried out. In addition, adsorption of the recording paper 113 to the conveyance belt 111 is performed by electrostatic adsorption. The rotation drive of the roller 113 is carried out in the direction which conveys the recording paper 103 in the direction of arrow A by driving sources, such as a non-illustrated motor. The recording paper 103 with which the conveyance belt 111 top was conveyed and record was performed by 101g of recording head groups in the meantime is discharged on a stocker 116.

[0109] the object for ***** to which each print head of 101g of recording head groups breathes out processing liquid — each head for ** head 101BK and color ink (cyan head 101C, Magenta head 101M, and yellow head 101Y) which breathes out the ink of the black explained with head 101S and the above-mentioned operation form 1 is arranged along the conveyance direction A of the recording paper 103 as illustration And the character of black and the print of a color picture are attained by ***** which breathes out the ink and processing liquid of each color by each print head.

[0110] Drawing 7 is the block diagram showing the control composition of the print equipment 1 of the full line type shown in drawing 6.

[0111] A system controller 201 begins a microprocessor, in case ROM and the microprocessor which store the control program performed with this equipment process, it has RAM used as a work area, and it performs control of the whole equipment. The drive is controlled by the driver 202, and a motor 204 rotates the roller 113 shown in drawing 6, and conveys the recording paper.

[0112] A host computer 206 transmits the information which should be printed to the print equipment 1 of this example, and controls the print operation. A receive buffer 207 stores the data from a host computer 206 temporarily, and it accumulates data until data reading is performed by the system controller 201. A frame memory 208 is the memory for developing the

data which should be printed to an image data, and has the memory size of a part required for a print, this invention is not limited by the capacity of a frame memory although this example explains a frame memory 208 as what can memorize a part for one sheet of recording paper.

[0113] Buffers 209S and 209P memorize temporarily the data which should be printed, and the storage capacity changes with the numbers of deliveries of a print head. The print control section 210 is for controlling the drive of a print head by the instructions from a system controller 201 appropriately, and it also creates the data for making processing liquid breathe out further while it controls drive frequency, the number of print data, etc. A driver 211 performs print head 101Bk for making print head 101S and each ink for making processing liquid breathe out breathe out, and the **** drive of 101C, 101M, and 101Y, and is controlled by the signal from the print control section 210.

[0114] In the above composition, from a host computer 206, print data are transmitted to a receive buffer 207, and are stored temporarily. Next, the print data stored are read by the system controller 201, and are developed by Buffers 209S and 209P. Moreover, a paper jam, an ink piece, a form piece, etc. are detectable with the various detection signals from the unusual sensor 222.

[0115] The print control section 210 creates the data for processing liquid for making processing liquid breathe out based on the image data developed by Buffers 209S and 209P, and -- each -- discharging of each print head is controlled based on the print data in buffer 209S and 209P, and the data for processing liquid

[0116] In this example, the processing liquid breathed out from Heads 101S, 101C, 101M, and 101Y about the ink of the black breathed out from head 101Bk using ink with a slow osmosis speed (henceforth [this example] addition system ink), respectively and cyanogen, a Magenta, and each color ink of yellow used the quick processing liquid and color ink (henceforth [this example] high permeability ink) of osmosis speed respectively.

[0117] The processing liquid used by this example and the composition of each ink are as follows. In addition, the weight section shows the rate of each component.

[Processing liquid]

Glycerol The seven sections Diethylene glycol The five sections ASECHIRE Norian EH The two sections (Kawaken Fine Chemicals make)

Poly allylamine The four sections (molecular weight : 1500 or less, the average 1000 [about]) Acetic acid The four sections Benzalkonium chloride The 0.5 sections Triethylene-glycol monobutyl ether The three sections Water Remainder [yellow (Y) ink]

C, 1, direct yellow 86 The three sections Glycerol The five sections Diethylene glycol The five sections ASECHIRE Norian EH The one section (Kawaken Fine Chemicals make)

Water Remainder [Magenta (M) ink]

C, 1, acid red 289 The three sections Glycerol The five sections Diethylene glycol The five sections ASECHIRE Norian EH The one section (Kawaken Fine Chemicals make)

Water Remainder [cyanogen (C) ink]

C, 1, direct blue 199 The three sections Glycerol The five sections Diethylene glycol The five sections ASECHIRE Norian EH The one section (Kawaken Fine Chemicals make)

Water Remainder [the ink of black (Bk)]

(Manufacture of pigment dispersion liquid)

After the [pigment dispersion-liquid 1] surface area often mixed carbon black 10g and 3.41 g of p aminobenzoic acid whose DBP oil absorption is 70ml / 100g in 72g of water by 230m²/g, 1.62g of nitric acids was dropped at this, and it stirred at 70 degrees C. The solution which melted the 1.07g sodium nitrite was added to 5g water after several minutes, and it stirred for further 1 hour. After having filtered the obtained slurry by Toyo Roshi No.2 (the Advan teeth company make), fully rinsing the pigment particle and making it dry in 90-degree C oven, water was added to this pigment and pigment solution of 10 % of the weight of pigment concentration was created. The pigment dispersion liquid 1 which the self-distributed carbon black charged in anionic [which the hydrophilic radical combined with the front face through the phenyl group by the above method as shown in the following formula] distributed were obtained. These pigment dispersion liquid 1 were used as a component of each following ink, if needed.

[0118]
[Formula 4]



[Pigment dispersion-liquid 2] pigment dispersion liquid 2 are adjusted as follows. The styrene-acrylic-acid-ethyl-acrylate copolymer (acid-number 180, average molecular weight 12000) 14 section, and the monoethanolamine 4 section and the water 72 section are mixed as a dispersant, it warms at 70 degrees C by the water bath, and a pitch is dissolved completely. Under the present circumstances, since the concentration of the resin in which it is made to dissolve may not dissolve completely with a low, in case a resin is dissolved, the high concentration solution is created beforehand, it may dilute and the resin solution of hope may be adjusted. By operation of a dispersant, the carbon black (tradename : MCF- 88, pH 8.0, Mitsubishi Chemical make) 10 section which can be distributed to an aqueous medium for the first time was added, and pre mixing was performed in this solution for 30 minutes. Subsequently, the following operations were performed and the pigment dispersion liquid 2 by which carbon black (MCF-88) was distributed by the aqueous medium with the dispersant were obtained.

These pigment dispersion liquid 2 were used as a component of each following ink if needed. Disperser, Side grinder (product made from the Igarashi machine)
pulverization media : -- filling-factor [of the diameter pulverization media of zirconia-beads 1mm]: -- 50% (volume)

Pulverization time: 3-hour centrifugal separation processing (for 12000RPM and 20 minutes)

(Manufacture of black ink)
Pigment dispersion liquid 1 The 25 sections Pigment dispersion liquid 2 The 25 sections Glycerol

The six sections Diethylene glycol The five sections ASECHIRE Norian EH The 0.1 sections (Kawaken Fine Chemicals make)

Water Ka value of the remainder, in addition this black ink was 0.33 (ml-m⁻² and msec-1/2).

[0119] By using the ink of the black by this example shown above, the processing liquid containing two sorts (the poly allylamine, benzalkonium chloride) of cation nature compounds of opposite polarity will react to the ink which self-distributed carbon black, the carbon black which can be distributed with a macromolecule dispersant, and a macromolecule dispersant are mixed, and is distributed.

[0120] In this example, the ink delivery of each print head is arranged by the density of 800dpi, and prints by the dot density of 800dpi in the conveyance direction of the recording paper.

Thereby, as for dot densities, such as a picture printed by this example, both the direction of a low and the direction of a column serve as 800dpi. Moreover, the **** frequency of each head is 4kHz, therefore the bearer rate of the recording paper serves as about 170 mm/sec.

Furthermore, the distance D1 (refer to drawing 6) between head 101S of the head 101Bk and processing liquid of mixed ink is 40mm, therefore time after processing liquid is breathed out until ink is breathed out serves as about 0.24 sec(s).

[0121] In addition, the discharge quantity of each print head is 15μl(s) (nico liter) per 1 ****. Moreover, after breathing out processing liquid S, the same result was able to be obtained also about the case where the time to ** which breathes out black ink Bk performs the supplementary examination by 0.1 seconds.

[0122] (Example 1-2) In the above-mentioned example 1-1, it experimented like the example 1-1 except having replaced composition of processing liquid and black ink with as follows.

[Processing liquid]

Glycerol The seven sections Diethylene glycol The five sections ASECHIRE Norian EH The two sections (Kawaken Fine Chemicals make)

Poly allylamine The 0.5 sections (molecular weight : 1500 or less, the average 1000 [about]) Acetic acid The 0.5 sections Benzalkonium chloride The four sections Triethylene-glycol monobutyl ether The three sections Water Remainder [the ink of black (Bk)]

Pigment dispersion liquid 1 The 45 sections Pigment dispersion liquid 2 The five sections

Glycerol The six sections Diethylene glycol The five sections ASECHIRE Norian EH The 0.1 section (Kawaken Fine Chemicals make)

Water Ka value of the remainder, in addition this black ink was 0.33 (ml-m⁻² and msec-1/2).

[0123] (Example 1-3) In the above-mentioned example 1-1, it experimented like the example 1-1 except having replaced composition of processing liquid and black ink with as follows.

[Processing liquid]

Glycerol The seven sections Diethylene glycol The five sections ASECHIRE Norian EH The two sections (Kawaken Fine Chemicals make)

Poly allylamine The one section (molecular weight : 1500 or less, the average 1000 [about])

Acetic acid The one section Benzalkonium chloride The four sections Triethylene-glycol monobutyl ether The three sections Water Remainder [the ink of black (Bk)]

Pigment dispersion liquid 1 The 45 sections Pigment dispersion liquid 2 The 2.5 sections C.1 hood black 2 The 0.25 sections Glycerol The six sections Diethylene glycol The five sections ASECHIRE Norian EH The 0.1 section (Kawaken Fine Chemicals make)

Water Ka value of the remainder, in addition this black ink was 0.33 (ml-m⁻² and msec-1/2).

[0124] (Example 1 of comparison) The ink of the following components was prepared only using the pigment dispersion liquid 2 prepared like the example 1-1 as an example of comparison over the above-mentioned example 1-1 to 1-3. Subsequently, it printed on the same conditions as an example 1-1 using this ink. In addition, processing liquid was not used in this example of comparison.

[0125] Pigment dispersion liquid 2 50 section ethylene glycol 8 section glycerol 5 section isopropyl alcohol 4**** While using the ink prepared like the example 1 of remainder (example 2 of comparison) comparison, ink discharge quantity used the head of about 30 pL(s) for Bk head per 1 ****, and it printed like the example 1 of comparison except having set the amount of ink grants per pixel to 30pL(s). The evaluation result of the print object obtained in the above-mentioned example 1-1 to 1-3, the example 1 of comparison, and the example 2 of comparison is shown in the following table 2.

[0126]

[Table 2]

	実施例 1-1	実施例 1-2	実施例 1-3	比較例 1	比較例 2
OD	1.42	1.40	1.42	1.00	1.35
耐水性発現時間	数秒以内	数秒以内	数秒以内	1時間程度	1時間程度
定着性	0.5秒	0.5秒以下	0.5秒以下	15秒	40秒
フエザリシフト (ミヤの有無)	A	A	A	A	A

In addition, the print in each example and each example of comparison prints a predetermined picture on PB form by Canon, Inc., and measures OD value of the black section etc. Moreover, picture collapse when OD value is measured among the evaluation criteria in Table 2 using the Macheeth density measurement machine and waterproof manifestation time hangs down water after a print is the time which can hardly be recognized visually, and fixing nature is time to lose back projection when paper is delivered to a print object further. Furthermore, feathering estimated "A" and the case where it was observed as "B", when an ink dot was observed with a magnifier, the existence of a MOYA-like portion and the existence of feathering were observed around a dot and they were not observed.

[0127] In the case of the system of this example, it is understood that the print object which was excellent in OD value and waterproof manifestation time, or fixing nature especially is obtained as compared with the print object in conventional pigment ink so that clearly from Table 2.

[0128] When it is this example with which the ink which the pigment which does not need a

dispersant, the pigment distributed by the dispersant, and the macromolecule dispersant mixed, and processing liquid are mixed, after producing the effect by those mixtures mentioned above and being given processing liquid about this OD value, an OD value higher than the case where only a pigment gives only a color can acquire.

[0129] Moreover, he can understand excellently [sharpness / of the edge section / suppression of feathering ("mist" and "exudation"), or] compared with the example of comparison also about the case where the time from the regurgitation of head 101S to the regurgitation of head 101Bk compares. In addition, when time after the processing liquid in Table 2 is breathed out until black ink Bk is breathed out was made into 0.1 seconds, the almost same evaluation result was able to be obtained.

[0130] The print equipment of the full multi-type explained above is used where a print head is fixed in print operation, and since the time which conveyance of the recording paper takes is the time which a print takes mostly, it fits a high-speed print. Therefore, by applying this invention to such a high-speed print device, the high-speed print function can be improved further, moreover, OD value is high and a high-definition print without bleeding or MOYA is enabled.

[0131] In addition, although the print equipment of this example is most generally used as a printer, it is natural, [of not being restricted to this but it being able to constitute as the print sections such as a reproducing unit and facsimile.]

[0132] In addition, the effect of this example explained with reference to the above table 2 can acquire the almost same effect, not only the composition that used one head about black mixture ink like this example but when it considers as two heads and discharge quantity of each head is set to about 16 pL(s) in about 8 pL(s) and the sum total.

[0133] (Example 2) Drawing 8 is the outline perspective diagram showing the composition of the print equipment 5 of the serial type concerning the 2nd example of this invention. That is, after giving processing liquid to a print medium, the print equipment applicable not only to a thing above-mentioned full line type but the equipment of a serial type to which breathe out ink and it is made to react is clear. In addition, the same sign is given to the element shown in drawing 5, and the same element, and the detail of the explanation is omitted. The recording paper 103 which is a print medium is inserted from the feed section 105, and paper is delivered to it through the print section 126. In this example, the cheap regular paper generally used widely is used as the recording paper 103. In the print section 126, carriage 107 carries print head 101S, 101Bk, and 101C, 101M and 101Y, and is constituted by the driving force of a non-illustrated motor possible [both-way movement] along with the guide rail 109. Print head 101S carry out the regurgitation of the processing liquid explained with the above-mentioned operation gestalt. Moreover, print head 101Bk, and 101C, 101M and 101Y are driven, respectively, so that the regurgitation of the black ink concerning this invention, cyan ink, Magenta ink, and the yellow ink may be carried out, respectively and the regurgitation of ink or the processing liquid may be carried out to the recording paper 103 in this sequence.

[0134] Ink tank 108S, 108Bk which correspond to each head, respectively, ink or processing liquid is supplied from 108C, 108M, and 108Y, and a driving signal is supplied to the electric thermal-conversion object established for every delivery of each head at the time of ink ****, i.e., a heater. By this Heat energy is made to act on ink or processing liquid, air bubbles are generated, and **** of ink or processing liquid is performed using the pressure at the time of this foaming. 64 deliveries are prepared in each head by the density of 360dpi, respectively, and these are mostly arranged perpendicularly with the conveyance direction Y of the recording paper 103, and the scanning direction according to this direction, i.e., each head, almost. And the discharge quantity for every delivery is 25pL(s).

[0135] In the above composition, each distance between heads is 1/2 inch, the distance of head 101S and 101Bk(s) becomes 1/2 inch, and time since the print density of a scanning direction of 720dpi and the **** frequency of each head is 7.2kHz, after the processing liquid of head 101S is breathed out until the black ink of head 101Bk is breathed out serves as 0.05sec(s).

[0136] (Example 4) the mixed ink which includes the example shown in drawing 6 and drawing 8 for both the 1st pigment and the 2nd pigment — not but When the 1st pigment and the 2nd pigment are applied to the thing of the gestalt which carries out the regurgitation separately,

each print head of 101g of recording head groups the object for processing liquid which carries out the regurgitation of the processing liquid → head 101S and the 1st object for the pigment ink of black → head 101BK1 and the 2nd object for the pigment ink of black → head 101BK2 and each head for color ink (cyan head 101C →) Magenta head 101M and yellow head 101Y are arranged along the conveyance direction A of the recording paper 103 as illustration. And the character of black and the print of a color picture are attained by carrying out the regurgitation of the ink and processing liquid of each color by each print head.

[0137] It is the processing liquid and cyanogen which are breathed out from Heads 101S, 101C, 101M, and 101Y in this example using the late addition system ink of osmosis speed, respectively about the 1st pigment ink of black and the 2nd pigment ink which are breathed out from head 101BK1 and 101BK2, respectively. Magenta Each color ink of yellow uses the quick hypertonicity processing liquid and quick hypertonicity color ink of osmosis speed respectively.

[0138] The composition of the 1st used by this example, the 2nd ink, and processing liquid is as follows.

[Processing liquid]

Glycerol The seven sections Diethylene glycol The five sections ASECHIRE Norian EH The two sections (Kawaken Fine Chemicals make)

Poly allylamine The four sections (molecular weight : 1500 or less, the average 1000 [about]) Acetic acid The four sections Benzalkonium chloride The 0.5 sections Triethylene-glycol monobutyl ether The three sections Water Remainder [the 1st pigment ink (Bk1) of black]

Pigment dispersion liquid 1 The 50 sections Glycerol The six sections JRIECHIREN glycol The five sections ASECHIRE Norian EH The 0.1 sections (Kawaken Fine Chemicals make)

Water Ka value of the remainder, in addition this black ink was 0.33 (ml-m-2 and msec-1/2).

[2nd pigment ink of black (BK2)]

Pigment dispersion liquid 2 50 section ethylene glycol 8 section glycerol 5 section isopropyl alcohol 4 **** It will react the 1st pigment, 2nd pigment, and macromolecule dispersant with which each were like-pole nature being mixed after processing liquid is given to paper by using the 1st pigment ink of black and the 2nd pigment ink by this example shown more than the remainder.

[0139] In this example, the distance D (refer to drawing 9) between head 101BK(s)1 of the head 101S and pigment ink of processing liquid is 40mm, therefore time after processing liquid is breathed out until black ink Bk1 is breathed out serves as about 0.24 sec(s). In addition, the discharge quantity of each print head is 15pl(s) per 1 **** except Bk head, and each Bk head was set to about 10 pl(s) per 1 ****. Therefore, when 1 pixel is formed with the head of Bk1 and BK2, about 20 pl grant of the Bk ink will be carried out in total.

[0140] When the print object obtained using such equipment and ink was evaluated like the above-mentioned example 1-1 to 1-3, the improvement in some [of OD] was found, and also the result almost equivalent to other examples was obtained.

[0141] (Example 5) Drawing 10 is the outline perspective diagram showing the composition of the print equipment 5 of the serial type which can use the ink containing the 1st pigment, and the ink containing the 2nd pigment for the process mixed on a print medium to the field where the processing liquid on a record medium was given. That is, the print equipment applicable not only to a thing above-mentioned full line type but the equipment of a serial type which can be used for this process is clear. In addition, the same sign is described to the element shown in drawing 9, and the same element, and the detail of the explanation is omitted.

[0142] The recording paper 103 which is a print medium is inserted from the feed section 105, and paper is delivered to it through the print section 126. In this example, the cheap regular paper generally used widely is used as the recording paper 103. In the print section 126, carriage 107 carries print head 101S and 101BK1, 101BK 2, 101C, 101M, and 101Y, and is constituted by the driving force of a non-illustrated motor possible [both-way movement] along with the guide rail 109. Print head 101S breathe out processing liquid, print head 101BK1 breathes out the 1st pigment ink of black, and print head 101BK2 carries out the regurgitation of the 2nd pigment ink of black. Moreover, print heads 101S, 101C, 101M, and 101Y are driven so that the regurgitation of processing liquid, cyan ink, Magenta ink, and the yellow ink may be carried out, respectively

and the regurgitation of the ink may be carried out to the recording paper 103 in this sequence at a processing liquid row.

[0143] Ink tank 108S, 108BK1, 108BK2, 108C which correspond to each head, respectively, ink or processing liquid is supplied from 108M and 108Y, and a driving signal is supplied to the electric, thermal-conversion object (heater) established for every delivery of each head at the time of ink ****, by this Heat energy is made to act on ink or processing liquid, air bubbles are generated, and **** of ink or processing liquid is performed using the pressure at the time of this foaming. 64 deliveries are prepared in each head by the density of 360dpi, respectively, and these are mostly arranged perpendicularly with the conveyance direction Y of the recording paper 103, and the scanning direction according to this direction, i.e., each head, almost. And the discharge quantity for every delivery of 15pl(s), the other ink, and processing liquid of the discharge quantity of the delivery of Bk ink is 23pl(s).

[0144] In the above composition, time when the print density of a scanning direction of 720dpi and the **** frequency of each head is 7.2kHz, after each distance between heads is 1/2 inch, therefore the distance of head 101S and head 101BK1 becomes 1/2 inch, and the processing liquid of head 101S is breathed out until the pigment ink of head 101BK1 is breathed out serves as 0.05sec(s).

[0145]

[Effect of the invention] The ink which contains a macromolecule dispersant for the 1st pigment, the 2nd pigment, and the 2nd pigment according to this invention. By giving processing liquid previously to a print medium, and giving ink succeeding, using this ink and the processing liquid which reacts, so that processing liquid and ink may be mixed by the print medium in the state of a liquid it has high OD, and excels in edge sharpness, and a picture with still few back omissions to the print medium of a picture can be acquired. Furthermore, a late fixing speed and the inadequate fixing nature which were made into the fault of conventional pigment ink are also sharply improvable.

[0146] Moreover, according to this invention, it can suppress very effectively that "exudation" or "mist" arises around a picture dot. When osmosis speed of processing liquid is carried out with Ka value by the Bristow method more than 5.0 (ml-m-2 and msec-1/2), processing liquid becomes the thing of comparatively high permeability, and becomes possible [fixing speeding up].

[Translation done.]

* NOTICES *

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1. This document has been translated by computer. So the translation may not reflect the original precisely.

2.*** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the conceptual diagram which explains "exudation" phenomenon of the reactant at the time of making ink and processing liquid react in presumption.

[Drawing 2] After giving processing liquid to a print medium in 1 operation gestalt of this invention, it is the conceptual diagram which explains the dot formation at the time of giving ink and making processing liquid and ink react in presumption.

[Drawing 3] (a) is an anionic self-distributed pigment-content child's conceptual diagram, (b) is the conceptual diagram of a cation nature high-molecular-compound molecule, and (c) is the conceptual diagram of a cation nature surfactant molecule.

[Drawing 4] It is a ** type view showing the reaction form in the boundary section of two anionic self-distributed pigments with which a cation macromolecule intervenes.

[Drawing 5] (A) is a graph which shows roughly change which ratio change of the 1st pigment in ink and the 2nd pigment gives to OD of a picture, and (B) is a graph which shows roughly change which ratio change of the 1st pigment in ink and the 2nd pigment gives to the back omission OD of a picture.

[Drawing 6] It is the side elevation showing the outline composition of the print equipment concerning one example of this invention.

[Drawing 7] It is the block diagram showing the control composition of the print equipment shown in drawing 6.

[Drawing 8] It is the outline perspective diagram of the print equipment concerning one example of this invention.

[Drawing 9] It is the side elevation showing the outline composition of the print equipment concerning other examples of this invention.

[Drawing 10] It is the outline perspective diagram of the print equipment concerning other examples of this invention.

[Description of Notations]

P Print medium

S Processing liquid

Ip Pigment ink

SP Osmosis nose of cam

D Distance between the head of pigment ink, and the head of processing liquid

1 Print Equipment

5 Print Equipment

6 Processing Liquid

7 Mist

8 Pigment Ink

9 Reactant

101g Head group

101 (Bk1, Bk2, S, C, M, Y) Print head (regurgitation section)

103 Recording Paper

104 Platen

105 Feed Section

107 Carriage

108 (Bk, Bk1, Bk2, S, C, M, Y) Ink tank

109 Guide Rail

111 Conveyance Belt

112 113 Roller

114 Resist Roller

115 Guide Plate

116 Stocker

126 Print Section

201 System Controller

202 Driver

203 Heater

204 Motor

206 Host Computer

207 Receive Buffer

208 Frame Memory

209S, 209P Buffer

210 Print Control Section

211 Driver

222 Unusual Sensor

[Translation done.]

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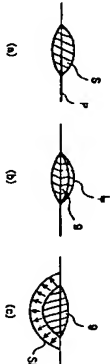
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(54) 発明の名称 イオンジェットプリント方法

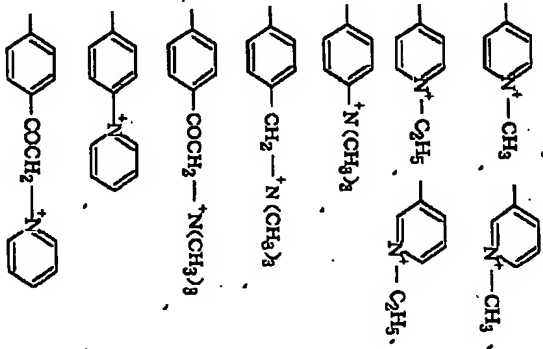
(57) 【要約】
【課題】 染料イオンを用いたイオンジェット記録方法によって、定着性に優れ、且つ高品位の画像を形成する方法を提供する。
【解決手段】 自己分散型である第1の染料と、第1の染料の有する極性基と同極性の高分子分散剤及びニオン性高分子分散剤の少なくとも一方とともに配合されていることで分散している第2の染料との両方を水性媒体中に含む混合イオン液、あるいは、これらの第1及び第2の染料をそれぞれ異なる2種のイオン液のセットと、これらのイオン液と反応する処理液とを用意し、プリント媒体上の処理液を付与した領域に、処理液と、混合イオン液またはイオン液のセットが液体状態で接する様にイオンジェット法によりこれらのいずれかを付与する。



(2) 特開2001-322346

【特許請求の範囲】
【請求項1】 プリント媒体上に画像を記録する工程を含むイオンジェットプリント方法において、

(1) イオン液をイオンジェット記録方法を用いてプリント媒体上に付着させる工程；および (1) 染料イオンと反応性を有する処理液を染料イオン媒体上に付着させる工程；を有し、
該工程 (1) は、該工程 (1) の後に、染料イオン媒体上で染料イオンと該処理液とが液体状態で接する様に行なわれ、
染料イオンは、水性媒体中に、第1の染料と、第2の染料と、染料第2の染料を分散させるための高分子分散剤と、染料第1の染料及び染料第2の染料がともに分散状態で染料イオン中に含まれ、
染料第1の染料が少なくとも1つのアニオン性の基が直接もしくは他の原子団を介して染料第1の染料の表面に結合されている自己分散型の染料あるいは少なくとも1つのカチオン性の基が直接もしくは他の原子団を介して染料第1の染料の表面に結合されている自己分散型の染料であり、染料第2の染料が高分子分散剤によって該水性媒体に分散させることのできる染料であり、
高分子分散剤が染料第1の染料の表面に結合されている基と同極性の高分子分散剤及びニオン性の高分子分散剤の少なくとも一方を含むことを特徴とするイオンジェットプリント方法、
【請求項2】 前記処理液はその浸透速度がガラストウ法によるKa値で5.0 (ml・m⁻²・sec^{-1/2}) 以上である請求項1に記載のイオンジェットプリント方法、
【請求項3】 染料イオンはその浸透速度がガラストウ法によるKa値で1.0 (ml・m⁻²・sec^{-1/2}) 未満である請求項1または2に記載のイオンジェットプリント方法、
【請求項4】 前記アニオン性基が、下記に示すアニオン性基の中から選択される少なくとも1つである請求項1〜3の何れかに記載のイオンジェットプリント方法、
-COOM、-SO₃M、-PO₃HM及び-PO₃M
2 (これらのMはそれぞれ独立して水素原子か、アルカリ金属か、アミン基か、あるいは有機アミン基を要する)、
【請求項5】 前記カチオン性基が、下記に示すカチオン性基の中から選択される少なくとも1つである請求項1〜4の何れかに記載のイオンジェットプリント方法、
-NH₃⁺、-NR₃⁺、-SO₂NH₂、-SO₂NHCO
R、
【化1】



(上式式中、Rはそれぞれ独立して、置換もしくは非置換のアルキル基、置換もしくは非置換のフェニル基又は置換もしくは非置換のナフチル基を示す。)
【請求項6】 前記染料は、炭素数1〜12のアルキレン基、置換基を有してもよいフエニレン基、あるいは置換基を有してもよいナフチレン基である請求項1に記載のイオンジェットプリント方法、
【請求項7】 前記第1の染料の粒子の80%以上が粒径0.05〜0.3μmである請求項1に記載のイオンジェットプリント方法、
【請求項8】 前記第1の染料の粒子の80%以上が粒径0.1〜0.25μmである請求項1に記載のイオンジェットプリント方法、
【請求項9】 前記第2の染料がその表面に高分子分散剤を吸着することにより分散されている請求項1に記載のイオンジェットプリント方法、
【請求項10】 前記高分子分散剤がスルホン酸系高分子分散剤およびカルバキレート系高分子分散剤の少なくとも一方である請求項1に記載のイオンジェットプリント方法、
【請求項11】 前記第2の染料が、少なくとも構造の異なる2種類の染料を含む請求項1に記載のイオンジェットプリント方法、
【請求項12】 染料第1の染料と染料第2の染料の重量比率が5/95〜97/3の範囲である請求項1に記載のイオンジェットプリント方法、
【請求項13】 染料第1の染料と染料第2の染料の重量比率が10/90〜95/5の範囲である請求項1に記載

のイオンジェットプリント方法。
【請求項14】 図解1の顔料と第2の顔料との出射が9/1〜4/6の範囲である請求項1に記載のイオンジェットプリント方法。

【請求項15】 図解1の顔料を図解2の顔料よりも多く含む請求項1に記載のイオンジェットプリント方法。
【請求項16】 図解1の顔料及び第2の顔料の少なくとも一方はカーボンブラックである請求項1に記載のイオンジェットプリント方法。
【請求項17】 図解1の顔料が更に図解1の顔料の表面に結合されている基と同一の極性の染料を含んでいる請求項1に記載のイオンジェットプリント方法。

【請求項18】 図解1の顔料がアニオン性染料もしくはカチオン性染料である請求項17に記載のイオンジェットプリント方法。
【請求項19】 図解1の顔料が陽性染料、直接性染料および反応性染料から選ばれる少なくとも一つである請求項18に記載のイオンジェットプリント方法。
【請求項20】 図解1の顔料がアニオン性染料がジスアゾ骨格またはトリスアゾ骨格を有する請求項18に記載のイオンジェットプリント方法。

【請求項21】 図解1の顔料の表面に結合されている基と反対極性の基を少なくとも一つ有する化合物を含む請求項1〜20の何れかに記載のイオンジェットプリント方法。
【請求項22】 図解1の顔料の表面に結合されている基と反対極性の基を少なくとも一つ有する第1の化合物と、図解1の顔料の表面に結合されている基と反対極性の基を複数個有する第2の化合物とを含む請求項1〜21の何れかに記載のイオンジェットプリント方法。

【請求項23】 図解1の化合物が塩化ベンザルモニウムであり、図解2の化合物がポリアリルアミンである請求項22に記載のイオンジェットプリント方法。
【請求項24】 図解1の化合物が、図解2の化合物との割合が、図解1の顔料の組成に対して実質的に最適化されている請求項22または23に記載のイオンジェットプリント方法。

【請求項25】 グリント媒体へのイオンジェットプリント方法であって、
(i) 第1のイオンを図解1の媒体に付与する工程；
(ii) 第2のイオンを図解1の媒体に付与する工程；および(iii) 図解1および第2のイオンの各々と反応する処理を図解1の媒体に付与する工程、を有し、図解1のイオン、図解2のイオン及び図解1の各々は、グリント媒体の表面において互いに液体状態で接触する様に付与されるものであり、
図解1のイオンが、顔料粒子の表面に少なくとも一つのアニオン性基が直接もしくは他の原子団を介して結合されている自己分散型顔料または少なくとも一つのカチオン性基が直接もしくは他の原子団を介して結合されている

自己分散型顔料を第1の顔料として水性媒体中に含むものであり、
図解2のイオンが、第2の顔料と、図解2の顔料を分散させるための高分子分散剤と、を水性媒体中に含み、図解2の顔料が高分子分散剤により水性媒体中に分散し得るものであり、図解2の高分子分散剤が図解1の顔料の表面に結合されている基と同一極性の高分子分散剤およびアニオン性の高分子分散剤の少なくとも一方を含み、
図解1の顔料の表面に結合されている基と反対極性の化合物を含むものであり、
かつ図解1(i)を、図解1(i)及び図解1(i)に先立って行なうことを特徴とするイオンジェットプリント方法。
【発明の詳細な説明】
【0001】
【発明の属する技術分野】 本発明は、イオンジェットプリント方法に関し、詳しくは色材を含むイオンおよびそのイオン中の色材を不溶化させる液体（以下、処理液と呼称する）を用いてプリント用紙、OHP用紙等のプリント媒体に文字、画像等のプリントを行うイオンジェットプリント方法に関する。

【0002】
【従来の技術】 イオンジェットプリント方式は、低騒音、低ランニングコスト、高速プリントが可能、装置の小型化が容易、カラー化が容易である等の種々の利点を有し、プリントや複写機等において広く利用されている方式である。このようなプリント等では、一般に、吐出特性、定着性等のプリント特性やプリント画像のじみや光学反射率、発色性等のプリント品位などの観点から用いるイオンが選択される。ところで、イオンは、その含有する色材により、染料イオンと顔料イオンの二種類に大別されることは広く知られたところである。
【0003】 このうち顔料イオンは、染料イオンに比べて耐水性、耐光性に優れ、また、鮮明な文字品位を可能とする等の利点を有している。その一方で、顔料イオンは染料イオンと比較してプリント媒体への定着に時間がかかったり、定着後の画像の耐湿性も十分でない場合があり、また、1吐出量が少ないことから、吐出されるイオンによってプリント媒体上に形成されるインクドットのサイズが小さくなる傾向が見られる。即ち、顔料イオンに含まれる顔料は、通常、主に、高分子分散剤の電気的反発力等を利用して、顔料粒子の凝集をもたらし、顔料粒子間に作用する分子間力に打ち勝たせてインク中に安定に分散させているものである。従って、インク中には顔料の量に応じて高分子分散剤を添加することが好ましい。このようなインクを普通紙上にイオンジェット記録法を用いて印字する、水分散のイオンの記録の紙への浸透、及び空気中への飛散により顔料同士が凝集する等の弊、紙上でのインクの暴動として、インク中に含まれる高分子分散剤の量が多い程、インクの凝集力

が強くなる。その為にイオンジェットヘッドから吐出された一定の体積を有するイオンによりプリント媒体上に形成された顔料ドットの径は小さくなり、また、紙に衝突した顔料の遠んだ形状に近いものとなり、紙に形成する、よって画像を形成するのに十分な記録速度を有し、かつ白点等の発生がないような記録に必要なドット径のイオンドットを得る為には、イオンジェットヘッドからのイオンの吐出体積を大きく目に調整する必要がある。しかし、このような調整を行っても、高分子分散剤が吸着した顔料粒子の凝集力が強いことによる紙中への浸透性の低下と相まって、インクのプリント媒体への定着の遅延を招き、或いは記録画像の耐湿性を低下させることがあった。

【0004】 ドット径の拡大、および定着性の向上を図る為にインクのプリント媒体への浸透性の向上を目的としてインクに浸透剤を含有させることも考えられている。しかし、これはドット形状の劣化（いわゆるフェザリング等のドット周囲形状の劣化）、紙の表面へのインクのはじき（いわゆる墨付け）等の高品位な記録画像を目指すうえで好ましくない現象を併発する場合がある。また、色材がプリント媒体内部に浸透してしまう為、ドット径は比較的大きくなったイオンドットのODはあまり高くない場合が多い。また、今後、積極的な展開が図られるであろう、イオンジェットプリントのビジネス用途への応用にあたっては、印字速度のより一層の向上が求められることが予想される。そのときに、インクの記録媒体への定着が不十分である、例えば印字済みの記録媒体が、イオンジェットプリントから連続的に排出され、積層処理されていく過程において、先に排出された第1の記録媒体の表面のイオンの定着前に、図解1の記録媒体に引き続いて排出された第2の記録媒体が図解1の記録媒体の印字面に積層され、第1の記録媒体表面の画像が引かれたり、あるいは第2の記録媒体表面に第1の記録媒体のイオンが付着したりするといった問題が生じる可能性があると考えられる。

【0005】 更に、自己分散型の顔料を用いたイオンが提案されており、このイオンでは前記した分散剤によって分散させられた顔料を含むイオンに比べて紙上での顔料の凝集力が弱い為か、ドット径の拡大を図ることができず、未だ十分とはいえない。
【0006】 この様に記録画像の品位を左右する様々な要素、例えばインクの定着性、イオンドット径の拡大、イオンドット内の濃度の均一性、イオンドット自体の高い光学透過率を高いレベルで満たすようなプリント方法には、多分に研究開発の余地が残されているということができる。

【0007】 一方、イオンジェットプリント技術において、印字品位や画像品位のより一層の向上（例えばプリント媒体上の画像の耐水性や光学透過率（OD）の向上等）を目的としてイオン及び顔料イオンと反応する処理液

【0008】

【発明が解決しようとする課題】 本発明者らは、顔料イオンの優れた特性を活かしつつ、顔料イオン特有の問題を解決すべく、顔料イオンと、図解1の顔料イオンの反応性を記録時に調整するような顔料イオンとの反応性を有する処理液と、を併用したイオンジェット記録技術について精力的な検討を行なった。その検討の一環として、処理液をプリント媒体表面に付与した後に顔料イオンを図解1の媒体上の顔料と反応させた後に顔料イオンを付与する処理プロセスを実施した。その結果として得られた画像は、その品質に満足できない場合があり、顔料イオン単独で形成した画像よりも卑る品位が低下する場合も観察された。具体的には、例えば顔料イオンとして高分子分散剤によって水性媒体中に分散させた顔料を含む顔料イオンと顔料イオンとを反応する処理液との組み合わせでは、イオンドットのエリアフィクチャーが小さいことに起因する光学透過率（OD）の低下が認められる場合があった。この中の顔料のプリント媒体上での凝集が処理液によって大幅に促進されたためではないかと考えられる。そのため顔料イオンの打ち込み量を増やすことでエリアフィクチャーを大きくし、ODの向上を図ることができると、この場合、定着性が劣ることを認められることがある。また、顔料イオンと自己分散型の顔料を含む顔料イオンと顔料イオンとを反応するような処理液との組み合わせによって得られるプリント媒体上のドットの辺部分には、所謂「しみ出し」もしくは「もや」と呼ばれる現象が生じ、明確なドットが得られないことがあった。図1はこの「しみ出し」や「もや」が生じたドットの平面模式図であり、中心の顔料イオン8と処理液8との反応部の周囲に、「しみ出し」による「もや」部7が観察される。図2は、この現象の発生メカニズムを模式的に説明する図である。

【0009】 処理液8がプリント媒体9（特に普通紙等）に付与された後に、顔料処理液8が付与された位置に自己分散型顔料を含み、高分子分散剤を含まない顔料イオン9（以降「分散剤無し顔料イオン」と略し10が図2(b)に示した様に、重ねて付与されると、反応物9の生成が速まる。そして、この反応が進行すると共に、図1(c)に示すように反応物にはほぼ円形状のドットから放射状の「しみ出し」を生じ、ドット全体ではその周囲に「もや」が広がったような状態となる。このような「しみ出し」もしくは「もや」は、外周上は、周知のフェザリングと同様に観察される為プリント品位を劣化させるものである。
【0010】 上述した「しみ出し」もしくは「もや」は、化学的あるいはミクロ的には次のような現象である

図1(c)に示すように反応物にはほぼ円形状のドットから放射状の「しみ出し」を生じ、ドット全体ではその周囲に「もや」が広がったような状態となる。このような「しみ出し」もしくは「もや」は、外周上は、周知のフェザリングと同様に観察される為プリント品位を劣化させるものである。
【0010】 上述した「しみ出し」もしくは「もや」は、化学的あるいはミクロ的には次のような現象である

を次に説明する。

【0099】本実施形態は、上述した実施形態において処理速度を調整性の高いものとし、これによってより層の高速処理を図ったものである。

【00991】高速処理は、プリント速度の高速化、すなわち、スループットの向上のための主要な構成である。プリントヘッドの駆動周波数やプリント媒体の搬送速度を調整することで、直接的にはスループットの向上は可能である。しかし、プリントが完了し排紙されたプリント媒体上のインク等が未定着の場合は、その後の取扱いが不便であり、また、排紙したプリント媒体を積層する構成にあつては、未定着のインクによって他のプリント媒体を汚すかもしれない。

【00994】すなわち、このプリント速度の高速化に寄与する種々の要素の中で、直接的に搬送されるものは、上述のように、プリントが完了したプリント媒体が排紙される速度であり、これはプリント媒体の搬送速度もしくはプリントヘッドの走査速度に依っている。すなわち、いわゆるフルマシナインクのプリントヘッドを用いる装置にあつては、プリント動作におけるプリント媒体の搬送速度がそのまま排紙速度を意味し、また、シリアルインクのプリントヘッドを用いる装置にあつては、走査速度が結果としてプリントが完了したプリント媒体の排紙速度に結びつくことになる。そして、上記プリント媒体の搬送速度等は、プリントの解像度、すなわちドット密度を媒介として画素に対するインク吐出周期と相関するものである。すなわち、複数のプリントヘッドから吐出されるインクによって1つの画素のプリントを行う構成にあつては、上記解像度を固定したとき、その画素に対する吐出周期と上記搬送速度等とが相関する。

【00995】本実施形態において、大きな搬送速度を有する処理液を用いることにより、特に、OD面向上等のため混合インクとして搬送速度の小さなものを採用した場合でも、比較的に高い定着が可能となる。

【00996】(処理液組成性) 処理液の組成は先に説明した通りであるが、インク中の第1の顔料、第2の顔料および高分子分散剤の種類および量に応じて処理液の組成を最適化することは、本発明のもたらす効果を最大限に享受するうえで好ましいものである。この点について以下に具体例を挙げて説明する。

【00997】第1の顔料として数面にアニオン性基を結合させた自己分散性カーボンブラック、第2の顔料として一般的なカーボンブラック、そして高分子分散剤としてスチレン-アクリル酸-アクリル酸エチル共重合体(数値18.0、平均分子量12000)を含むインク、および低分子カチオン性化合物として塩化ベンズルコニウム(EBK)と高分子カチオン性化合物としてポリアリルメチン(PAA)を含む処理液を用意し、そして処理液中のEBKおよびPAAの比率を(PAA：50

3、6重量%、EBK：0、5重量%)に固定し、インク中の自己分散性カーボンと通常のカーボンブラックの比率を変化させていったときに、得られる画像の特性を評価した(なお高分子分散剤の量は通常のカーボンブラックの量の増減に対応して増減させた)。

【00998】図5(A)は、処理液の組成を固定し、インク中の第1の顔料と第2の顔料の重量比を変化させたときに得られる画像のODの変化を概略的に示したグラフである。このグラフから分かる様に第1の顔料と第2の顔料の割合が所定の値のときにODが極大を示す。

【00999】図5(B)は、処理液の組成を固定し、インク中の第1の顔料と第2の顔料の重量比を変化させたときに得られる画像を、プリント媒体の裏側から測定したOD(裏側OD)の値にて測定したものであり、やはり第1の顔料と第2の顔料の割合と裏側ODとの間に相関があることがわかる。

【01001】次に、処理液中のEBKとPAAの比率を変化させて同様の実験を行った。その結果、EBKを増やした場合には、傾向としてODが低下するが、PAAを含有することでODはそれほど低下しない、但しEBKの割合を増やした場合でも、自己分散型顔料の比率が高いほどODが高くなる。定着時間は、EBKが増加して速くなくなる。また、自己分散型顔料が増加して速くなくなる。

【01011】この事実からPAAと高分子分散剤分散カーボンブラックとの間、およびEBKと自己分散型カーボンブラックとの間に密接な関係があることが推定される。このことは以下の推定が根拠により説明されるものと考えられる。即ち、自己分散型顔料は、模式的に変わらず先に述べた様に図3(a)に示したような形態を有し、また、カーボン高分子であるPAAは、図3(b)のように1分子中に複数のカチオン基を有したひも状の物質である。ここで処理液中にPAAのみが入っていた場合、自己分散型顔料とPAAとが混合すると、図4のように自己分散型顔料の周囲にPAAの高分子が絡みつく。しかしながら、PAAのカチオン基は、幾何学的にすべての顔料のアニオン基と結合することが困難であるため、図4のように結合したものが全体的にカチオン性を有した状態の形態になつていと考えられる。

言い換えれば顔料の分散性が十分に確保されない状態となる。そしてインク中に顔料と顔料粒子等の周囲がカチオン基によって囲まれた状態になると分子間力よりも電気的斥力の方が強く作用し、微細な顔料粒子同士の凝集が妨げられ、プリント媒体の表面に残留するよりは寧ろ内部に浸透していく傾向が促進される。その結果、ODやエンジンジャーネスの向上を妨げる方向に作用する。ここで図3(c)に3005で示したような形態のEBKが処理液中に存在すると、自己分散型カーボンブラックとPAAの反応は自己分散型カーボンブラックとの反応との競争反応となり、自己分散型カーボンブラ

ックとPAAとの結合体が生ずる割合は低下する。一方、第2の顔料では、表面に付着した高分子分散剤と処理液中のPAAとが絡みつき易くなる。その結果、インク中の顔料の分散性が十分に確保され、顔料がプリント媒体表面に残りやすくなる。よってODやエンジンジャーネスが向上するものと考えられる。

【01021】より具体的には例えば、自己分散型カーボンブラックと高分子分散剤で分散させるカーボンブラックの比率を1：1としたインクに対してポリアリルメチンと塩化ベンズルコニウムの比率を(PAA：3、6重量%、EBK：0、5%)とし、且つ高速処理とした処理液を組み合わせた場合、定着性に優れるとともに、特にエンジンジャーネスに優れた画像を得ることができ、

【01031】また、自己分散型カーボンブラックと高分子分散剤で分散させるカーボンブラックの比率を9：1としたインクに対してポリアリルメチンと塩化ベンズルコニウムの比率を(PAA：0、5%、EBK：4%)とし、且つ高速処理とした処理液を組み合わせた場合、特に高速な定着性と優れた画像品位とを両立した画像を得られる。なおこの画像が高速定着と高画像品位の両立を達成できる理由としては、処理液中に高分子化合物が少ないこと、インク中にも高分子分散剤が少ないことによる反応の遅延の少ない事などが挙げられる。

【01044】(実施形態2) 上記第1の実施形態は、第1の顔料および第2の顔料を含むインクを用いた形態を主として説明したが、図1の顔料および第2の顔料を別々のインクに含有させた形態もまた本発明の範囲のものである。

【01051】(実施形態2-1) 本形態は、第1の顔料を含む第1のインク、第2の顔料を含む第2のインクおよび図1ならびに第2のインクと反応する処理液をプリント媒体表面に互いが液体状態で接触する様に付与するものである。そしてそのときに、第1のインクと第2のインクの記録媒体への付与に先立って該処理液を付与するものであり、これによって上記した本発明の種々の効果とはほぼ同等の効果を得ることができ、

【01061】
【実施例】 本発明の実施例について、図を参照しながら詳細に説明するが、本発明はこのような実施例に限らず、これらをさらに組み合わせた、同様な課題を内包する他の分野の技術にも応用することができる。
【01071】(実施例1-1) 図6は第1実施例に係るフルマシナインクのプリント装置の概略構成を示す断面図である。このプリント装置1は、プリント媒体としての記録媒体の搬送方向(図中、矢印A方向)に沿って所定位置に配置された複数のフルマシナインクのプリントヘッド(吐出部)よりインクまたは処理液を吐出してプリントを行うインクジェットプリント方式を採用するものであり、後述する図7の制御回路に制御されて動作する。

【01081】ヘッド群101Eの各プリントヘッド101S、101B、101C、101Mおよび101Yのそれぞれは、図中A方向に搬送される記録紙103の幅方向(図の紙面に垂直な方向)に約7200個のインク吐出量を配列し、最大A3サイズの記録紙に対しプリントを行うことができる。記録紙103は、搬送用ローラによって駆動される一對のレジストローラ114の回転によりA方向に搬送され、一對のガイド板115により案内されてその先端のレジ合わせが行われた後、搬送ベルト111によって搬送される。エンプレスメントである搬送ベルト111は2個のローラ112、113により保持されており、その上面部分の上下方向の傾位はブラデフ104によって傾斜されている。ローラ113が回転駆動されることで、記録紙103が搬送される。なお、搬送ベルト111に対する記録紙113の吸着は静電吸着によって行われる。ローラ113は不図示のモータ等の駆動源により記録紙103を矢印A方向に搬送する方向に回転駆動される。搬送ベルト111上に搬送される間に記録紙101Eによって記録が行われた記録紙103は、スリット116上へ排出される。

【01091】記録ヘッド群101Eの各プリントヘッド101B、カラーインク用各ヘッド(シアンヘッド101C、マゼンタヘッド101M、イエローヘッド101Y)が、記録紙103の搬送方向Aに沿って図示の通りに配置されており、そして、各プリントヘッドにより各色のインクと処理液を吐出することでラックの文字やカラー画像のプリントが可能になる。

【01101】図7は、図6に示したフルマシナインクのプリント装置1の制御構成を示すブロック図である。
【01111】シマコンローラ2011は、マイクロプロセッサをはじめ、本装置で実行される制御プログラムを格納するROM、マイクロプロセッサが処理を行う際にワーエリアとして使用されるRAM等を有し、装置全体の制御を実行する。ローラ204はドライバ202によってその駆動が制御され、図6に示すローラ113を回転させる。記録媒体の搬送を行う。

【01121】ホスコンビュータ206は、本実施例のプリント装置1に対してプリントすべき情報を搬送し、そのプリント動作を制御する。受信バッファ207は、ホスコンビュータ206からのデータを一時的に格納し、シマコンローラ2011によってデータ読み込みが行われるまでデータを蓄積しておく。フレームメモリ208は、プリントすべきデータをイメージデータに展開するためのメモリであり、プリントに必要な分のメモリサイズを有している。本実施例では、フレームメモリ208は記録紙1枚分の記憶可能なものとして説明するが、本発明はフレームメモリの容量によって限定されるものではない。

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【0113】バツワフ209S、209Pは、フリントすべきダータを一時的に記憶するものであり、フリントへの吐出回数によりその記憶容量は変化する。フリント制御部210は、フリントへの駆動をシフトコンローラ201からの指令により適切に制御するためのものであり、駆動周波数、フリントデータ数等を制御するとともに、さらには処理液を吐出させるためのデータも作成する。ドライバ211は、処理液を吐出させるためのフリントへのフリント101B、101C、101M、101Yの吐出駆動を行うものであり、フリント制御部210からの信号により制御される。

【0114】以上の構成において、ホストコンピュータ206からフリントデータが受信バツワフ207に伝送されて一時的に格納される。次に、格納されているフリントデータはシフトコンローラ201によって読み出されてバツワフ209S、209Pに周回される。また、紙詰まり、インク切れ、用紙切れ等を異常センサ2

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22からの各種検知信号により検知することができる。

【0115】フリント制御部210は、バツワフ209S、209Pに周回された画像データに基づいて処理液を吐出させるための処理液用データの作成を行う。そして、各バツワフ209S、209P内のフリントデータおよび処理液用データに基づいて各フリントへの吐出動作を制御する。

【0116】本実施例では、ヘッド101Bから吐出されるフランクのインクについては、浸透速度の遅いインク（以下、本実施例では浸透系インクという）を用い、ヘッド101S、101C、101M、101Yからそれぞれ吐出される処理液およびフランク、マゼンタ、イエローの各カラーインクは各々浸透速度の速い処理液およびカラーインク（以下、本実施例では高浸透系インクという）を用いた。

【0117】本実施例で使用される処理液および各インクの組成は次の通りである。なお、各成分の割合は重量部で示したものである。

【処理液】		7部
グリセリン	ジエチレングリコール	5部
マゼンタ E H	マゼンタ E H	2部
(II研アインケミカル製)		
ボリアリルアミン		4部
(分子重:1500以下、平均価約1000)		
酢酸		4部
塩化ベンザルコニウム		0.5部
トリエチレングリコールモノメチルエーテル		3部
水		残部
【イエロー (Y) インク】		
C. I. ダイレクトイエロー 86		3部
グリセリン		5部
ジエチレングリコール		5部
マゼンタ E H		1部
(II研アインケミカル製)		
水		残部
【マゼンタ (M) インク】		
C. I. アソフベッド 289		3部
グリセリン		5部
ジエチレングリコール		5部
マゼンタ E H		1部
(II研アインケミカル製)		
水		残部
【シアン (C) インク】		
C. I. ダイレクトブルー 199		3部
グリセリン		5部
ジエチレングリコール		5部
マゼンタ E H		1部
(II研アインケミカル製)		
水		残部

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【フランク (Bk) のインク】

【原料分散液の調製】
【原料分散液1】表面積が23.0cm²/gでDBP吸油量が70ml/100gのカーボンプラック10gとP-7ミノ安泰香酸3.41gとを水72gとよく混合した後、これに顔料1.62gを滴下して70℃で攪拌した。数分後5gの水に1.07gの亜硝酸トリウムを溶かした溶液を加え、更に1時間攪拌した。得られたスラリーを炭素黒(N.O. 2 (アトベンデクス社製))でろ過し、顔料粒子を十分に水洗し、90℃のオーブンで乾燥させた後、この原料に水を足して顔料濃度10重量%の原料水溶液を作成した。以上の方法により、下記式に示した様に表面に、フェニル基を介して親水性基が結合したアクリル性樹脂に帯電した自己分散型カーボンプラックが分散した原料分散液1を得た。この原料分散液1を必要に応じて以下の各インクの成分として使用した。

【0118】
【化4】



*

粉砕機：サイロタイプインター (五十嵐機械製)
粉砕メディア：ジルコニアビーズ1mm径
粉砕メディアの充填率：50% (体積)
粉砕時間：3時間
選り分け処理 (12000RPM、20分間)

(16)

特開2001-322346

* 【原料分散液2】原料分散液2は次のようにして調製したものである。分散剤としてマゼンタ・フランク・アクリル酸エチル系重合体 (価値180、平均分子重12000) 14部と、モノエタノールアミン4部と水72部を混合し、ウオーターバスで70℃に加熱し、樹脂分を完全に溶解させる。この溶解液をさらに、樹脂分が低いと完全に溶解しないことがあるため、樹脂を溶解する際は、高浸透液をあらかじめ作成しておき、希釈して希望の樹脂濃度を調整してもよい。この溶液に、分散剤の作用によって初めて水性媒体に分散可能なカーボンプラック (商品名：MCF-88、PH8.0、三硝化型) 10部を加え、30分間ブレイキングを行った。次いで以下の操作を行ない、カーボンプラック (MCF-88) が分散液によって水性媒体に分散された原料分散液2を得た。この原料分散液2を必要に応じて以下の各インクの成分として使用した。

【フランクインクの調製】		
原料分散液1	2.5部	
原料分散液2	2.5部	
グリセリン	6部	
ジエチレングリコール	5部	
マゼンタ E H	0.1部	
(II研アインケミカル製)		
水		残部

なお、このフランクインクのK_a値は0.33 (ml・m⁻²・sec^{1/2}) であった。

【0119】以上示した本実施例によるフランクインクを用いることにより、自己分散型カーボンプラックと高分子分散剤で分散可能なカーボンプラックと高分子分散剤が混合され、かつ分散しているインクに対して、異性のカーボン性化合物2種 (ボリアリルアミン、塩化ベンザルコニウム) を含んだ処理液とが反応することになる。

【0120】本実施例では、各フリントヘッドのインク吐出量は600dpiの密度で配列され、また、記録紙の搬送方向において600dpiのドット密度でフリントを行う。これにより、本実施例でフリントされる画像等のドット密度はロー方向およびカラカ方向のいずれも600dpiとなる。また、各ヘッドの吐出間隔数は4

40 同様な結果を得ることができた。

【0122】(実施例1-2) 上記実施例1-1において、処理液およびフランクインクの組成を下記の様に代えた以外は実施例1-1と同様にして実験を行なった。

【処理液】		7部
グリセリン	ジエチレングリコール	5部
マゼンタ E H	マゼンタ E H	2部
(II研アインケミカル製)		
ボリアリルアミン		0.5部

(分子重:1500以下、平均値約1000)

苛性 0.5部

塩化ベンザルコニウム

トリエチレングリコールモノメチルエーテル

水 残部

【テラック (Bk) のインク】

顔料分散液1 4.5部

顔料分散液2 5部

グリセリン 6部

ジエチレングリコール 5部

アセチレノール EH 0.1部

水 (11部)テラックミカル製)

残部

なお、このテラックインクのK_a値は0.33 (a)・ η^2 ・ η^{20} ・ η^{20} であった。

【0123】 (実施例1-3) 上記実施例1-1において*

【処理液】

グリセリン 7部

ジエチレングリコール 5部

アセチレノール EH 2部

水 (11部)テラックミカル製)

ポリアリルメチン 1部

(分子重:1500以下、平均値約1000)

苛性 1部

塩化ベンザルコニウム 4部

トリエチレングリコールモノメチルエーテル 3部

水 残部

【テラック (Bk) のインク】

顔料分散液1 4.5部

顔料分散液2 2.5部

C.1.フーデラック2 0.25部

グリセリン 6部

ジエチレングリコール 5部

アセチレノール EH 0.1部

水 (11部)テラックミカル製)

残部

イソプロピルアルコール 4部

水 残部

(比較例2) 比較例1と同様に調製したインクを用いる

とともに、インク吐出量1吐出あたり約30p1のヘ

ットをBkヘットに用い、1画面当りのインク付着量を

30p1とした以外は比較例1と同様にしてプリントを

行った。上記実施例1-1~1-3、比較例1及び比較

例2にて得られたプリント物の評価結果を下記表2に示

す。

【0126】

【表2】

	33		34	
	実施例1-1	実施例1-2	実施例1-3	比較例2
OD	1.42	1.40	1.42	1.00
雨水性発現	数秒以内	数秒以内	数秒以内	1時間程度
時間	数秒以内	数秒以内	数秒以内	1時間程度
定着性	0.5秒	0.5秒以下	0.5秒以下	15秒
フェザリン	A	A	A	A
グ (モヤの				
有無)				

なお、各実施例および各比較例でのプリントは、キヤノン株式会社製のPB用紙に所定の画像をプリントし、黒色部のOD値等を測定したものである。また、表2における評価項目のうち、OD値はマックス高速測定機を用いて測定したものであり、また、雨水性発現時間は、プリント後に水をたらしたときの画像くずれが自覚にてほとんど認識できない時間であり、さらに、定着性はプリント物が剥紙されたときの裏写りがなくなる時間である。更に、フェザリンはインクドットをルーペによって観察し、ドット周辺にモヤ状の部分の有無、フェザリンのの有無を観察し、それらが観察されない場合には「A」、観察される場合を「B」と評価した。

【0127】表2からも明らかなように、本実施例のシスチアの組合、従来の顔料インクによるプリント物と比較して、特に、OD値および雨水性発現時間や定着性に優れたプリント物が得られることが理解される。

【0128】このOD値については、分散剤を必要としない顔料と分散剤によって分散せられる顔料および高分子分散剤が混合したインクと処理液とが混合される本実施例の場合、それらの混合による前述した効果を生じ、処理液が付与された後、顔料のみあるいは染料のみを付与した場合より高いOD値を得ることができ、

【0129】また、フェザリン「もや」や「しみ出し」の抑制やエッジ部のシャープネスについて、ヘットF101Sの吐出からヘットF101Bの吐出までの時間によって比較した場合についても、比較例に比べて優れていることが理解できる。なお、表2中の処理液が吐出されてからテラックインクが吐出されるまでの時間を0.1秒とした場合においても、ほぼ同様な評価結果を得られた。

【0130】上記説明したフルカラータイプのプリント装置は、プリントヘッドがプリント動作において固定された状態で用いられ、記録紙の搬送に要する時間がほぼプリントに要する時間であるため、特に高速プリントに適したものである。従って、このような高速プリント機器に本発明を適用することによって、さらにその高速プリント機能を向上でき、しかも、OD値が高く、フラーデインクやモヤのない高品位のプリントを可能とするものである。

【0131】なお、本実施例のプリント装置は、最も一般的にはプリントとして用いられるものであるが、これに限らず複写装置、フロッピー等のプリント部として構成可能であることは勿論である。

【0132】なお、以上の表2を参照して説明した本実施例の効果は、本例のようにテラック混合インクについて1つのヘッドを用いた構成に限らず、2ヘッドとし、各ヘッドの吐出量を約8p1、合計で約16p1とした場合もほぼ同様の効果を得ることができ、

【0133】(実施例2) 図8は本発明の第2の実施例に係るシリルアルゴのプリント装置5の構成を示す概略図である。すなわち、処理液をプリント媒体に付与した後、インクを吐出して反応させるプリント装置は、上述のフルカラータイプのものに限らず、シリルタイプの装置にも適用できることは明らかである。なお、図6に示した要部と同様の要素には同一の符号を付しその説明の詳細を省略する。プリント媒体である記録紙103は、給紙部105から挿入されプリント部126を経て排紙される。本実施例では、一般に広く用いられる安価な普通紙を記録紙103として用いている。プリント部126において、キヤリッジ107は、プリントヘッドF101S、101B、101C、101Mおよび101Yを搭載し、不図示のモータの駆動力によってガイドレール109に沿って往復移動可能に構成されている。プリントヘッドF101Sは、前述の実施形態で説明した処理液を吐出する。また、プリントヘッドF101B、101C、101M、101Yはそれぞれ本発明にかかっているテラックインク、シアンインク、マゼンタインク、イエローインクをそれぞれ吐出するものである。この順序で記録紙103にインク又は処理液を吐出するよう駆動される。

【0134】各ヘッドにはそれぞれ対応するインクタンク108S、108B、108C、108M、108Yからインク又は処理液が供給され、インク吐出時にはヘッドの吐出口部に設けられている電気駆動機構、すなわちヒータに駆動電圧が供給され、これにより、インク又は処理液に熱エネルギーを作用させて気泡を発生させ、この発泡時の圧力を利用してインク又は処理液の吐出が行われる。各ヘッドには、それぞれ360度p1の角度で64個の吐出口が設けられ、これらは、記録紙103の搬送方向Yとはほぼ同方向、つまり、各ヘッドによる走

